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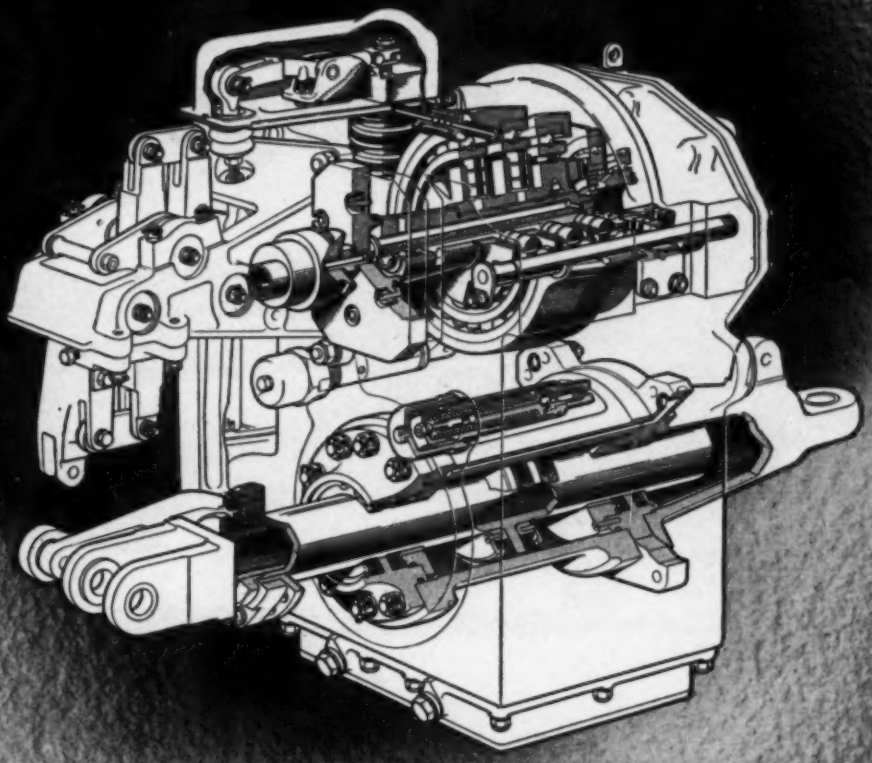

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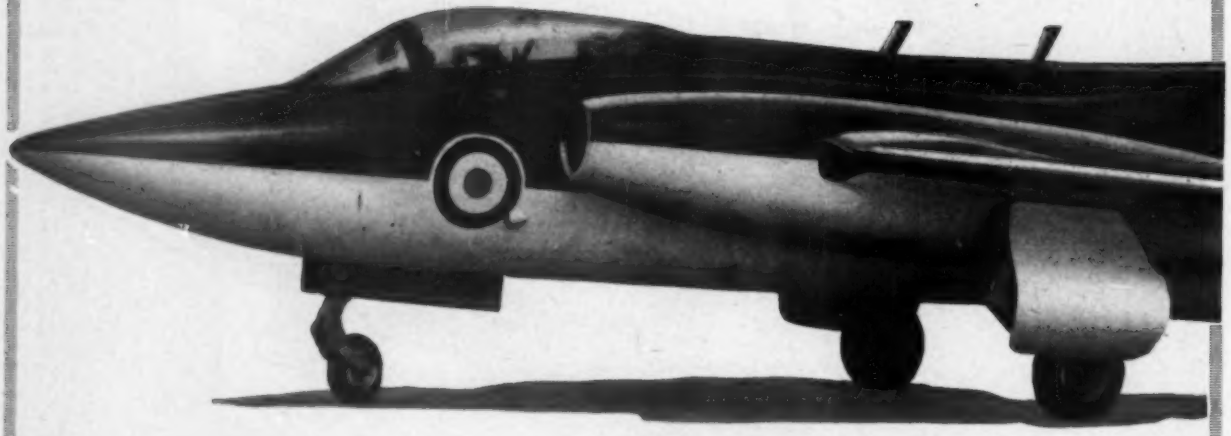
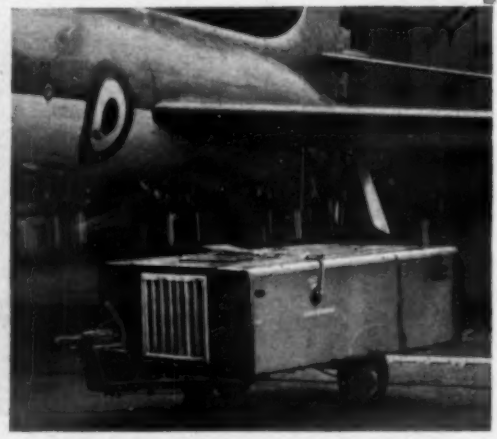
Blackburn report progress



The 'N.A.39', the latest in a long line of Blackburn naval aircraft, which first flew in April 1958.

(*below, left*) 'Beverleys', in service with R.A.F. Transport Command, received favourable comments from all sources.

(*below, right*) The Blackburn 'Palouste' gas turbine starter trolley on the flight deck of H.M.S. *Ark Royal*.



Mr. Eric Turner
The Chairman of Blackburn and General Aircraft Ltd., reviews another successful year—

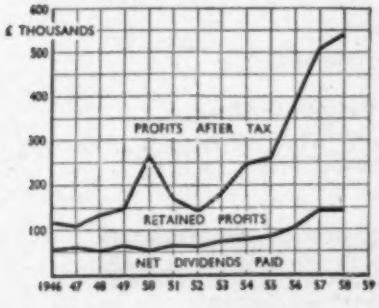
ACCOUNTS

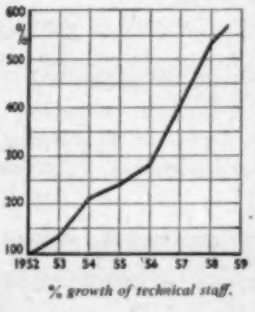
As forecast, the profits for the year are very similar to those of the previous year, the balance, after all charges other than taxation, being £1,025,013 compared with £1,018,491. The provision for taxation shows a reduction compared with last year because of the allowances received on substantial capital expenditure during the year, and in consequence the nett profits amount to £547,104 compared with £514,356.

The total reserves and unappropriated profits, quite apart from the amount set aside for future taxation, are now twice the issued capital. The most significant

change in the figures is that this year we have a cash balance of £389,794 compared with a nett overdraft last year of £513,701.

The capital expenditure of the Group during the year was £479,000, the bulk of which was spent at Brough. You will see that at the Balance Sheet date the outstanding commitments for additional capital expenditure of approximately £165,000 showed a reduction compared with last year's figure and I anticipate that the new capital expenditure during the current year will also show a similar reduction. A revaluation of the fixed assets of the Group as at 1st April, 1957, disclosed a surplus over book values of £1,402,139 notwithstanding the fact that conservative valuations were placed on certain specialised buildings and equipment. We have decided not to write up the value of the fixed assets in our books, at any rate for the time being.





% growth of technical staff.

REVIEW OF ACTIVITIES

'Beverleys' for the Royal Air Force have continued to be the chief product at Brough during the year, and once more the production programme has proceeded exactly according to plan.

There was great activity during the year on the 'N.A.39' Naval Strike Aircraft, which culminated in the successful flight of the first prototype on 30th April, 1958. This was the target date set some three years earlier, and we believe that the meeting of the date in this way represents a unique achievement in the development of modern aircraft in this country. The prototype has, of course, flown many times subsequently, and the flight results to date have fully lived up to our expectations. We now have a most adaptable and imaginative aircraft which I can say without fear of contradiction is years ahead of any competitor. I am sure that you will join with me in congratulating all those concerned with the design and manufacture of the aircraft on their considerable achievements.

The volume of work in the Engine Division continues to grow. Orders for gas turbines have been received in substantial quantities, especially for the 'Palouste' for starting jet and turbo-prop aircraft. Our gas turbines are being installed in several helicopters under development and a number have been ordered, against considerable American competition, for incorporation in aircraft in Canada.

I am very gratified by the considerable progress which has been made by the Building Division at Dumbarton during the past year. In spite of highly competitive conditions, it looks as though the order book for the current year might reach record proportions.

FUTURE OUTLOOK

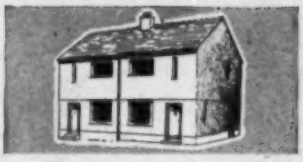
Last year I said that there were prospects of our having an attractive programme for a number of years, and subsequent events have increased my confidence rather than lessened it.

The readjustment of the industry is perhaps analogous to musical chairs. The music has stopped and those companies which have chairs remain in the competition; I am glad to say that your Company is to be numbered among them. At this moment we find ourselves with the 'Beverley' in service, a promising replacement for it in the project stage, and the 'N.A.39', with all its great possibilities, in the early stages of prototype flying.

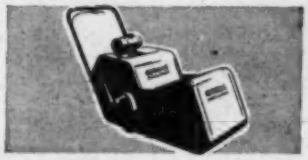
I am disappointed that we have not yet been asked to develop the 'Beverley' to give it longer range, greater speed and lifting capacity, but the need for such an aircraft as quickly as possible in R.A.F. Transport Command is still so clear and unequivocal that we are continuing with our design work on a private venture basis.

The interest in and possibilities of the 'N.A.39' are very considerable indeed. Your Directors have always had in mind that the aircraft would, with insignificant modification, be eminently suitable as a 'Canberra' replacement for the Royal Air Force without involving the delay and expenditure on research and development which would be necessary to produce a completely new aircraft for this purpose. Other Navies and Air Forces are taking great interest in it and there are also possibilities of the aircraft being made wholly or partly under licence in one or two other countries.

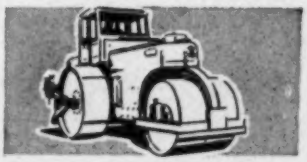
I cannot help feeling that the gloomy view which has been taken by so many people about the long-term prospects of the aircraft industry in this country may have been exaggerated. Be that as it may, your Directors feel confident that the prospects of your Company in the aircraft field are bright.



In spite of competitive conditions, considerable progress has been made by the Building Division. The most encouraging contract is that for the erection of six blocks of 15-storey flats.



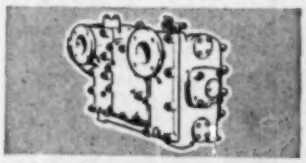
In spite of difficulties created by the destruction of part of the works by fire, Mower Division sales were rather greater than those of the previous year.



In common with its competitors, the Roller Division suffered a decline in orders. I feel that with the road developments now in progress at home and abroad, the position is bound to improve.

A considerable amount of design and development work is being undertaken by the Agricultural Equipment Division with a view to new products being introduced in 1959.

The financial results of the Jowett Company were again thoroughly satisfactory. The major portion of the Company's capacity is still devoted to the manufacture of spares and vehicle overhaul.



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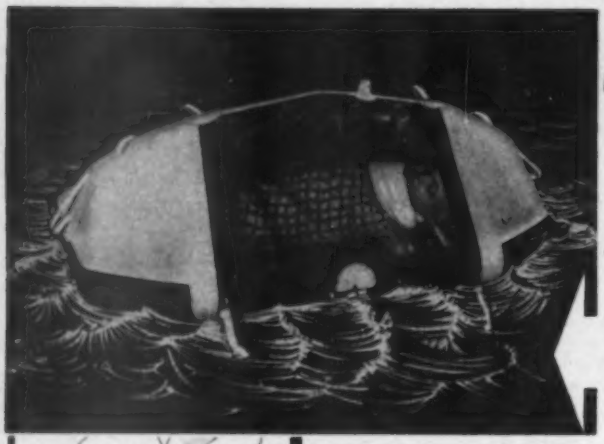

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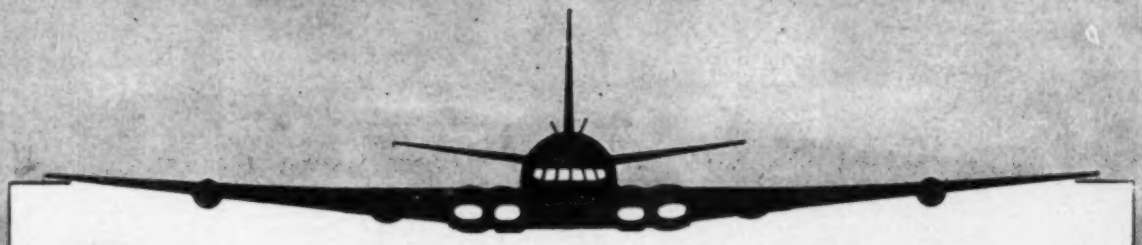

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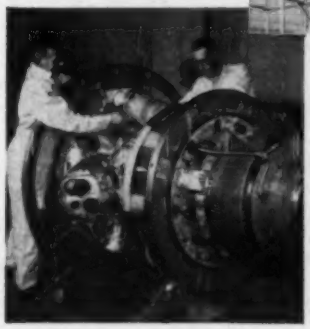

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AIRCRAFT ENGINEER

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In this issue

251 World Parachuting Championships
256 The Case for the Comet
259 Commonwealth Aviation 1958:
260 Aircraft v. Forest Fire
262 The Canadian Industry
270 Airline Competition in Canada
272 Cold Lake Warms Up
274 Canadian Ancillary Companies
280 Commonwealth Air Transport
283 The Australian Industry
286 Australian Ancillary Companies
288 India and New Zealand

The New Dimension

WITH the attempted dispatch of a U.S. rocket to the Moon last Sunday, and with the first flight of the North American X-15—designed to carry a man into outer space—scheduled for early next year, things are warming up in the race to the back of beyond. At this rate, it will not be long before the question of internationalizing space becomes urgent. Dr. J. A. Joyce, in an article on the subject in our pages last week, raised some pertinent questions: What if children are produced on a trip to or from the Moon? When the first earthly baby is born in a space-ship, under U.N. jurisdiction, would it not legally become the first world citizen? These questions hinge upon the length of time crew and passengers would be away from earth on space flights. They are not so academic as they may sound; and as the law usually takes a fairly long time to catch up on new forms of human behaviour it is right that the United Nations Organization should consider soon what law should deal with the problems that may arise.

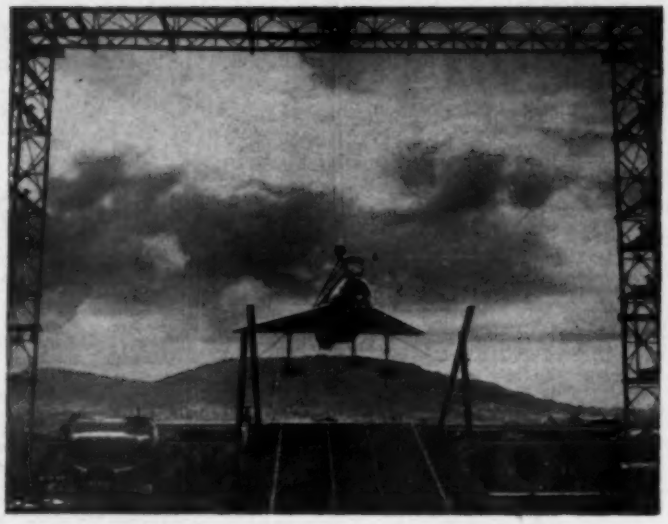
The same sort of questions, of course (as Dr. Joyce pointed out), affect those vast frozen areas at the northern and southern ends of our planet. The amazing work which has been done by scientists of all nations during the International Geophysical Year has shown that the Poles are no longer the almost inaccessible places they were in the brave pioneering days of Shackleton, Amundsen, Scott and Byrd. Air power has inhabited the dreadful wastes and a Fleet Street reporter can now drop in at the Poles to get a story as easily (almost) as he can get one in Scotland or the Sahara. Now the epic voyages of the U.S.N. submarine *Nautilus* and her sister vessel *Skate* have given the Polar regions and the under-water areas of this world a more sinister implication. For if nuclear weapons can be fired from undetectable points below the waves, why bother firing them from fixed missile bases or from aircraft? Clearly the boundaries of this known world are shrinking faster than ever, and if it can be saved from destruction (which is the prime task of U.N.O. and the professional politicians), the next steps in aeronautical development must needs be taken into space and the conduct of human behaviour in that new dimension will need regulating. This would be the task of the proposed U.N. Space Agency; and if that materializes it is to be hoped that the problems with which it would have to deal would be peaceful ones.

Already some strategists have their eye on the Moon as a base for firing missiles Earthward. This it an utterly dreadful prospect, a nightmare of the worst possible kind. For if we should pursue our quarrels to the Moon, and give our human battlefields a new dimension, we should prove unworthy inhabitants of the Universe. Man has conquered the Earth, and nothing can stop him (if the worst comes to the worst) directing missiles from one part of it to another; but the exploration of space, and journeys to the Moon, should be made on a basis of scientific co-operation as so splendidly exemplified in I.G.Y. work.

Missing from Farnborough

AN impressive list of new aircraft which are to participate at Farnborough has been issued by the S.B.A.C.; but in the dozen fresh types there is nothing new for the club pilot or private owner, who from year to year is consistently ignored by British aircraft manufacturers. So the flying clubs have to make do with their Moths, Austers and Chipmunks. Meanwhile the Poles produce their PZL.102 Kos and the French their Jodel D.140; the virtues of the Czech Zlin Trener are well known here; and the choice available to American private owners has always been embarrassingly wide. Perhaps (as was suggested here a few weeks ago) an interim solution would be for some British manufacturer to licence-build a Continental design, for example the Jodel D.117, the Druine Condor or the C.P. Emeraude. But as a better alternative, now that military orders are much harder to get, why should not one of our major companies produce a completely new design? The private owner has been much too long ignored.

FROM ALL QUARTERS



HOVERING in its test gantry at Belfast is the Short SC.1 VTOL research aircraft (five Rolls-Royce RB.108 turbojets). The cable system provides a three-dimensional envelope of freedom for hovering and in no sense supports or assists the aircraft. Posts at the front and rear of the gantry are visual aids for the pilot.

Lunar Probe Attempt

FIRED from Cape Canaveral on August 17 in an attempt to put a scanner and recording equipment into lunar orbit, the U.S.A.F. three-stage rocket Thor-Able 1 exploded 77 sec after being launched. It had then reached a height of 50,000ft on what was to have been a 226,000-mile journey. An official statement issued immediately after the failure said: "The space test vehicle launched at the Atlantic missile range at 0718 E.S.T. [1.18 p.m. B.S.T.] this morning exploded after 77 seconds' flight. The cause of the malfunction will not be known until telemetry data has been processed. The United States will schedule another space flight experiment at a later date." Maj-Gen. B. Schriever, who commands the U.S.A.F. Ballistic Missiles Division, said afterwards that there might have been a leak or rupture in the fuel lines of the first-stage Thor rocket, which should have burned for 157 sec before falling away. Mr. Roy Johnson, of the Advanced Research Projects Agency, confirmed that the rocket had not been deliberately destroyed by the range safety officer.

The next U.S.A.F. attempt is due to be made early in September, when the moon is again at its nearest to the earth.

Thor-Able 1 consisted of a Thor IRBM, a modified Vanguard second stage with eight extra spin rockets, and an advanced Vanguard with a solid-propellant motor and a payload of 85 lb. This payload included a solid-propellant terminal rocket in the nose, with a thrust of 3,000 lb, to serve as a brake on the vehicle when it reached lunar gravity. Instruments contained in the nose-cone weighed 25 lb.

Signals were received clearly at Cape Canaveral during the first 77 sec of the flight, and they continued to be heard for about a minute after the explosion occurred.

Australian Industry Rationalization

SINCE the review of the Australian aircraft industry on pages 283-286 went to press, further news has been received from Melbourne concerning moves to rationalize the industry. At present the Federal Cabinet has before it a report by the Australian Minister for Supply, Mr. Athol Townley, from which decisions are expected to be made that may well have an important bearing on the future of both the Commonwealth Aircraft Corporation and the Government Aircraft Factories.

Mr. Townley's recommendations will have as their background a recent survey of the industry's organization, conducted by a committee of industrialists, financial experts and others under the chairmanship of Sir Alexander Fitzgerald. Their report has not been published—and is unlikely to be published in any detail—but it is understood that they favour a concentration of government support for the Commonwealth Aircraft Corporation with a consequent limiting of the present wide but thinly spread activities of the Government Aircraft Factories.

It is accepted that the Government Aircraft Factories are unlikely again to get a bomber production contract, but that the Commonwealth Aircraft Corporation will build a supersonic fighter or fighter/bomber of a type yet to be selected by the R.A.A.F. The belief is, therefore, that all aircraft maintenance work now divided between the two organizations should be concentrated at the Commonwealth Aircraft Corporation.

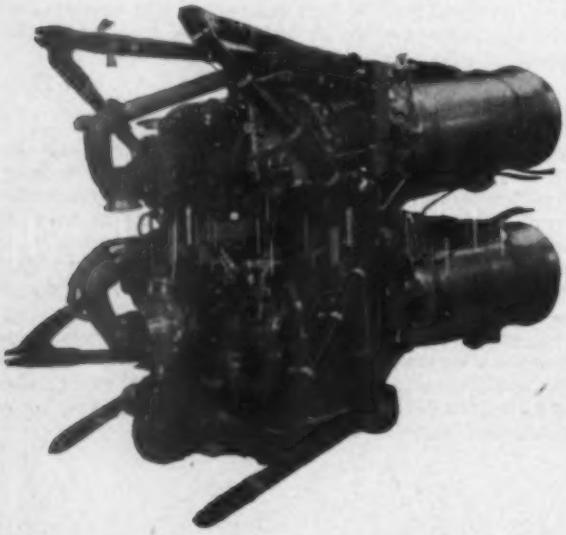
The Government Aircraft Factories will be retained, but probably reorganized purely as a missile development and supply unit—this, of course, including such projects as the existing Jindivik target aircraft.

Current thinking is that the Government Aircraft Factories may eventually vacate the present Fishermen's Bend plant, which could be sold to private industry, and that the Factories would be contracted to a more economic unit either at Avalon (the jet testing field and final assembly centre) between Melbourne and Geelong, or at some other site on the outskirts of Melbourne. All this, of course, is still subject to government consideration.

One rationalization move has already been determined. The N.S.W. Lidcombe engine and overhaul factory, owned by the government but up to now operated by the Commonwealth Aircraft Corporation, has been transferred to de Havilland of Bankstown, N.S.W. De Havilland engine overhaul work now performed at Bankstown will be transferred there, and the D.H. Propellers annexe at Alexandria is to be closed down and this work also put into Lidcombe.

Information was also released recently—as we briefly reported last week—concerning the Malkara anti-tank missile, 150 of which have been ordered by the British Ministry of Supply. Mr. Aubrey Jones and Mr. Athol Townley, speaking in Melbourne on August 11, said that the missile resembled the American-designed Dart, weighing 200 lb, and that it had completed many highly successful tests at Woomera and Puckapunyal.

Malkara was conceived at the Aeronautical Research Laboratories of the Department of Supply at Fishermen's Bend and was developed by a Government Aircraft Factories team led by the designer of the Jindivik, Mr. Ian Fleming. According to recent Australian newspaper reports, the Australian missile is approximately 6ft long, with cruciform wings. A speed of 250 m.p.h., a range of two miles, and wire-guidance system were also reported.



DOUBLE SPECTRE ROCKET: First picture of the de Havilland Double Spectre, which has been undergoing intensive development as a missile and intercepter main propulsion unit since the end of last year. It comprises a fixed-thrust DSpe.4 mounted above a fully controllable DSpe.5, both operating on H.T.P. and kerosine. Several hundred runs have been made, but no thrust figures may be quoted.

Thousand-mile Heat Detector

ANOTHER tit-bit of information dropped by the Minister of Supply, Mr. Aubrey Jones, during his visit to Australia is that the United Kingdom has developed an extremely sensitive photocell. "These devices," he said, "are so sensitive they can detect immediately on launching a ballistic missile from a range of more than 1,000 miles." The equipment obviously requires a large, fixed installation, involving big scanners and—in addition to the PbS or other cell—a maser-type unit.

VISUAL EVIDENCE of the success of tests in Australia of the Bristol/Ferranti Bloodhound ground-to-air, semi-active radar-homing missile is afforded by these two remarkable views. They show a test round closing on a radio-controlled Gloster Meteor target aircraft (despite vigorous evasive tactics) and the kill a split second later.

A Kaman Rotodyne?

NEGOTIATIONS between the Fairey Aviation Company and the Kaman Aircraft Corp. may lead to licence-production of the Rotodyne by the American company. Fairey state, "We think the Rotodyne has a very bright future, both from the civil and military aspects, but there is no chance of selling a military aeroplane to the United States . . . that cannot be built in their own country." Fairey have been attempting to obtain increased financial support from the Ministry of Supply; a Kaman licence would probably make this more likely.

Rockets for the Lightning

IT is now permissible to state that Microcell, Ltd., have developed retractable packs, each housing twenty-four 2in spin-stabilized rockets, for mounting on each side of the fuselage of the English Electric P.1B Lightning intercepter. Each pack is constructed in glass-fibre polyester resin with cast light-alloy hinges. When stowed, the plastic outer skins are flush with the Lightning fuselage. The launchers are pivoted near their outboard edges through bearings in the hinge castings; opening and closing is effected by hydraulic jacks, the sequence of opening, firing and closing being automatic. All electrical and rippling devices are contained within the launcher. Successful ground-to-ground firing has already been completed.

Microcell will be exhibiting the new packs at the forthcoming S.B.A.C. Show. In addition, the company have produced pylon-mounted 24- and 37-tube launchers for the Javelin, Scimitar and Sea Vixen and retractable 14-tube launchers for the last-named aircraft.

Three Airliner Accidents

RECENT days have been sombre ones for air transport; from the Atlantic Ocean, Massachusetts, and from Japan comes news of three serious accidents to airliners on scheduled services. The number of fatalities has been tragically heavy, as in two of the aircraft lost there were no survivors.

The accident over the North Atlantic—the first to a civil transport since scheduled crossings began—occurred to a K.L.M. Super-Constellation, PH-LKM, about 130 miles from the Irish coast; the aircraft left Shannon Airport at 0405 hr B.S.T. on Thursday, August 14, with 91 passengers and a crew of eight on board. A scheduled radio check was made from the aircraft at 0445, but another call, expected at 0640, did not come through and a full alert was declared. Unfortunately, Gander erroneously reported radio contact at 0730, and the alert was cancelled for the following two hours. Much wreckage was later found by ships and aircraft searching the area and several bodies were recovered, but there were no survivors. First appearances suggested a mid-air explosion; but at the inquest, held last Monday at Galway, this theory was discounted by pathologists. The Constellation had been flying in squally weather between heights of 12,000 to 16,0000ft.

Two days previously a DC-3 of All-Nippon Airways had come down in the sea about an hour after taking off from Haneda airport, Tokyo, for Nagoya. Twelve minutes before the accident occurred the pilot reported that his starboard engine had failed and that he was heading for Kisaraze as he was losing height. The wreckage was found, but hopes of finding survivors among the 30 passengers and three crew on board were later abandoned.

The accident on Nantucket Island, Massachusetts, occurred on August 16 to a Northeast Airlines Convair 240 attempting an instrument landing in fog at Nantucket Airport. The aircraft crashed in a field 300 yards short of the runway, disintegrated and caught fire. Of the 31 passengers and crew of three on board, 23 were killed and the remainder injured. The circumstances are reported to be that the pilot was told that sufficient visibility existed for a landing but the fog closed in a few minutes later and communication with the aircraft could not be re-established.

Still-longer Lives for Darts

BY October, engines in British airline service with overhaul lives of 2,000 hr may be a reality. The Rolls-Royce Dart 506 and 510 engines (in B.E.A.'s Viscount 701s and 802s) have recently been approved for 1,800 hr and development trials for the next 200 hr are already in progress. Nor is the limit set by 2,000 hr; further trials by progressive stages up to 2,500 hr are contemplated.

The three-stage turbine engine, the Dart 520, at present has an overhaul life of 600 hr, but this is shortly to be extended to 800 hr with 2,000 hr as an eventual target. When B.E.A. began to overhaul their own Darts, the lives established on Rolls-Royce overhaul were not immediately granted to B.E.A. The airline's first two Dart 506 engines will be examined at 600 hr and the second two at 1,200; if the results are satisfactory it is then hoped to achieve parity with Rolls-Royce overhauled engines.

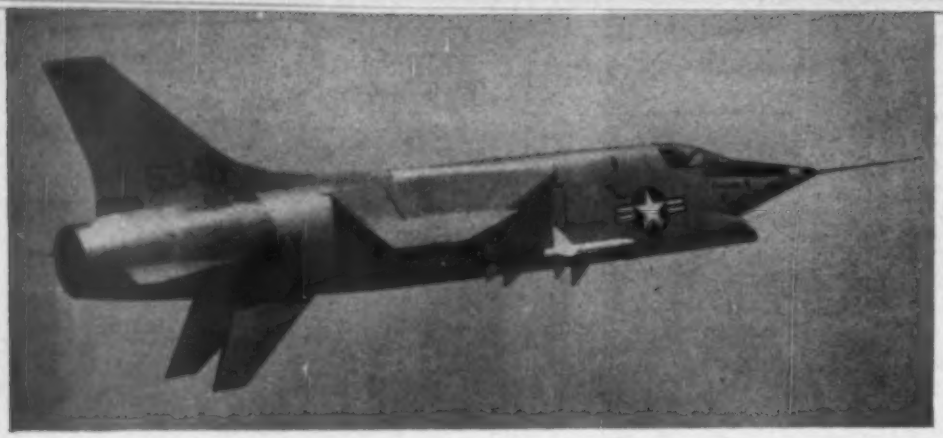
Astronautical Congress

THIS year's International Astronautical Congress—the ninth—is being held in Amsterdam from next Monday (August 25) to August 30. Among the speakers will be Wernher von Braun, Dr. Theodor von Kármán, and Dr. Eugen Sänger. The theme of the congress is "Propulsion and Propellants"—though other aspects of the science are not excluded—and nearly 80 papers are to be read. The official British delegates are Mr. L. J. Carter, secretary of the British Interplanetary Society, and Mr. Kenneth W. Gatland, the Society's vice-chairman.

In conjunction with the technical Congress a colloquium on space-law is being held on August 30 under the chairmanship of Mr. Andrew G. Haley (president of the International Astronautical Federation), the well-known authority on international law.

"Flight" photograph

NEW SHAPES in British skies last week were (left) the RW.3 Multoplan (subject of an air test report in "Flight," December 27, 1957), and the T.K. Flying Group's Druine Turbi. The Multoplan was being demonstrated at Croydon, Shoreham and Hurn by Herr Birnbaum, from Cologne. D.H. production test pilot Pat Fillingham flew the Turbi.



U.S. NAVY'S NEWEST: First air-to-air photograph of the Chance-Vought F8U-3 Crusader. It has ventral fins which, set nearly vertically for high-speed stability, can be raised to the horizontal for landing. Either Sparrow 3 (seen here) or Sidewinder missiles can be carried. Powerplant is a Pratt and Whitney J75.

FROM ALL QUARTERS . . .

Farnborough Debuts

THIRTEEN aircraft which have not appeared before at an S.B.A.C. Display—some of them entirely new, others more advanced versions of existing types—are scheduled to make their public debut at Farnborough next month. They are the Short SC.1 (which will not be seen in action); Fairey Rotodyne and early-warning Gannet; Saunders-Roe P.531 (a detailed description of which was given in *Flight* for August 8); Westland Westminster (similarly described in *Flight*, last week); Blackburn NA.39; Bristol 192; D.H. Comet 4 and 3B; Handley-Page Dart-Herald; Auster Alpha; Avro Vulcan B.2; English Electric Canberra T.11 radar trainer; and the Rolls-Royce Tyne-Ambassador test-bed.

In the flying programme 37 aircraft are due to participate, ranging in speed from the F.D.2 and the P.1B Lightning to the Alpha (which is to give a crop-spraying demonstration), the D.H.C. Beaver and the recently announced agricultural version of the Chipmunk. Nine helicopters are scheduled to fly, and both the R.A.F. and the Fleet Air Arm are participating in the display programme. In the static park, in addition to the SC.1 some twenty aircraft will be on view—including the Canberra U.10 pilotless drone.

The show opens on Tuesday, September 2, the preceding day being a Press and technicians' preview day. September 2, 3 and 4 (Tuesday, Wednesday and Thursday) are reserved for S.B.A.C. guests and on Friday, Saturday and Sunday—September 5, 6 and 7—the public will be admitted. Tickets can be obtained at the gates on all three days, but for Friday—and Friday only—they may be bought in advance through Auto-Parks, Ltd., 1 Maclise Road, London, W.14 (Shepherd's Bush 5385), and other entertainment-ticket agencies. The flying display starts at 3 p.m. on the public days (2.30 p.m., private days) and the gates are open at 10 a.m.

Prices on the Friday are: adults, 20s; children under 14, 10s; car parking, 20s; motor cycles, 5s. On the Saturday and Sunday admission is: adults, 5s; children under 14, 2s 6d; cars (including up to six occupants), 30s; motor cycle parking, 2s 6d. Details of coach and party booking arrangements are obtainable from Auto-Parks, Ltd., at the address given above. British Railways can provide information on special rail facilities.

IN BRIEF

Appointed Deputy Head of the Ministry of Supply staff and Director, Guided Weapons and Electronics, at the British Joint Services Mission in Washington, Mr. C. N. Jaques is to take up his new duties in October this year. He has been in charge of the Instrument and Photographic Department at the R.A.E., Farnborough.

* * *

What is described as a "substantial contract" for converting Danish Meteor N.F.11s for target towing has recently been concluded by Sir W. G. Armstrong Whitworth Aircraft, Ltd. This order follows successful trials carried out with T.T.20s—the latest mark of Meteor—specially converted for the Royal Navy. Further developments, using improved targets, are now taking place.

* * *

A committee has been formed to administer the fund which was recently initiated to provide suitable accommodation for the prototype Mosquito at Salisbury Hall (see *Flight*, August 8). The members are Sir Geoffrey de Havilland, Mr. Charles Gibbs-Smith, Miss Constance Babington Smith and G/C. John Cunningham. The treasurer is the manager of the Midland Bank branch at 122 Finchley Road, London, N.W.3, where donations should be sent.

At an Israeli Air Force display at Beersheba on August 12 there were twelve different types of aircraft on show, including the Israeli S.O. 4050 Vautour, making its first public appearance.

* * *

The Royal Aeronautical Society Prize in Aeronautics has been awarded to A. G. J. Baker, as the best student of his year in the diploma course at the College of Aeronautics.

"FLIGHT" AND FARNBOROUGH

THIS is the first of four special numbers of *Flight* being published in connection with the S.B.A.C. Show. The remaining three are:—

August 29: "Britain's Aircraft Industry". A detailed, specially illustrated review of British aircraft, engines and components, including a directory to the products and services of several hundred firms.

September 5: "Farnborough Report". A first-hand report on the aircraft and flying demonstrations at the opening of the show.

September 12: "Farnborough Review". The rest of the show-week news and pictures together with a further survey of technical innovations. Regular features will appear in this and the other Farnborough numbers.

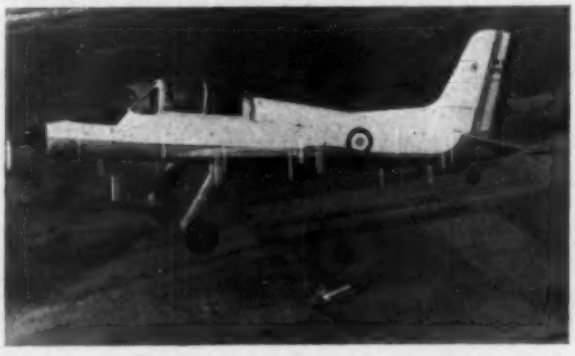
Demand for these special issues is always heavy, so advance orders to newsagents are strongly advised. The greatly enlarged August 30 issue will sell at 2s 6d, the other two at the normal price of 1s. 6d.

S.B.A.C. university scholarships for 1958 have been awarded to J. A. Radcliffe (Handley Page, Ltd.); N. A. Barrington (Bristol Aircraft, Ltd.); J. R. Craig (Bristol Aero-Engines, Ltd.); P. E. Hall and J. Humphreys (A. V. Roe and Co., Ltd.); H. Holtby (Blackburn and General Aircraft, Ltd.); and Q. Wilson (Scottish Aviation, Ltd.). With the exception of N. A. Barrington, who is going to Imperial College, all the students will go to the College of Aeronautics, Cranfield.

* * *

Power Jets (Research and Development), Ltd., has announced "with very great regret" the closing of the School of Gas Turbine Technology at Farnborough on December 12, at the conclusion of No. 152 introductory and practical course. The decision to close has had to be taken because, "whilst there has always been steady support for the School by organizations and individuals, the number of students passing through has now dropped to such a level that it is considered no longer economic to run the courses."

NO TOY: Suggestive at first glance of a light private two-seater, the Morane Saulnier M.S.1500 is in fact a ground-attack aircraft of considerable potential. The turboprop is a Turboméca Marcadau or, subsequently, Bastan. Guided-weapon armament is possible.



World Parachuting Championships

PART II: RED TAPE AND A QUICK FINISH

By T. W. ("Dumbo") Willans

MY first report on the fourth World Parachuting Championships (in *Flight* last week) was datelined from Bratislava. This second half, oddly enough, could be accurately datelined "Henley-on-Thames." Had I still been (as I expected) in Czechoslovakia, I should be enjoying the hospitality of Kosmetika (the Bratislava cosmetics co-operative) with the rest of the British delegation. I was looking forward particularly to meeting their chief chemist, and continuing our conversation of a few evenings ago, when we sipped a glass of good red wine with the local wine co-operative. She is the youngest, blondest and most attractive chief chemist I have yet had the pleasure of meeting.

Perhaps it should be explained that, as briefly noted in my "stop press" last week, the championships—run with the smooth efficiency of a military operation—progressed at such a pace that they finished well ahead of schedule.

The food and accommodation at the Mlada Garda (Young Guard) students' hostel were first-class, and the whole business was set fair for announcement to the Western world as a masterpiece of organization and good will. But there I found just one small snag—there seemed to be no way whatsoever of getting one's story and pictures out.

I arrived at Bratislava equipped with typewriter, camera, and a complete portable developing outfit in case there should be any picture censorship in force. I did not really expect one, because two years ago, when the third championship was held in Russia, there was no picture problem at all. In fact, when my camera was damaged while I was taking pictures of parachutists from the air, it was quickly taken to a mechanic, who spent half the night repairing it. I did not develop a single shot in Russia, but brought back all the material, intact and undeveloped, to England. This time, however, things were very different. Though not strictly germane to the purpose of this account, the sad story is worth telling in some detail.

At the start of the first day's practice I asked our official interpreter to confirm that I would be permitted to take pictures from the aircraft from which the British team was to jump. To my surprise, he returned from a conversation with the management and said, calmly, "No . . . it is quite impossible."

This came as an unpleasant shock for, taken from the ground, one picture of a parachutist is very much like another. In a world championship there is not even much novelty in a picture of someone landing close to the centre of the target, because most of the experts do that as a matter of routine. I asked the reason for the decision not to allow airborne photography. Our interpreter shrugged his shoulders. "It is impossible," he repeated. "It is not permitted."

I next approached one of the organizers for special permission to take the pictures I needed, telling him that I would offer all my negatives for censorship. He smiled. "There is a State monopoly," he said. "Only Czech cameramen may take air pictures. In any case, our cameramen were not allowed to take pictures of helicopter aerobatics at the National Air Races in Coventry." This was becoming curiouser and curiouser, because the thing I remembered most about the Coventry air display was rain. I just could not remember helicopter aerobatics. However, there is nothing quite as satisfying as a good reprisal, and I left it at that until the evening of the dinner given by the Czechoslovak Aero Club to celebrate the opening of the competition. Mr. Grepl, president of the Aero Club, would sort out this mistake for me. There would be no more problems.

Sgt. James McLoughlin, R.A.F., leaves the aircraft in a perfect swallow-dive in the final event—the individual jump from 1,500 metres with marking for free fall and precision landing.

Mr. Grepl left his seat at the dinner table and indicated a smaller table where we could talk without interruption. I explained the situation to him and he sat thinking for a few moments. Then the official who had mentioned the Coventry affair came and sat down with us and said a few words to Mr. Grepl. The latter listened with a serious expression, and at last he said "it is not permitted to take photographs from the air, particularly at the Vajnory airfield. At other airfields it would be different—Prague, for instance."

I said that I assumed this must be for security reasons, and offered to take with me in the aircraft a policeman, who could later follow me to the dark-room and see the picture developed. I pointed out that I was allowed to fly without a camera, and my eyes could probably see anything that the camera could see. Anyway, even if there was a troop concentration on the airfield I could not care less. What I wanted was pictures of parachutists —our parachutists. Just one picture would do.

Mr. Grepl explained patiently that it was not a matter of tanks and guns—it was something else. At this point I was beginning to become intrigued. Perhaps it was from Vajnory that the first moon-rocket would be launched?

But Mr. Grepl went on, "it is a question of money. . . ." I looked surprised and the interpreter immediately checked facts. "It is NOT a question of money," he corrected quickly.

There seemed to be no point in carrying such a discussion further. In a depressed mood I drank a glass of beer and went to bed.

* * *

The American and British teams declined, in the nicest possible way, to carry Czech photographers in their aircraft until similar facilities were given to us. There was one exception to this rule, when permission was given for me to take air pictures—at a time when a long-drawn-out meeting prevented me from accepting the invitation. Taking advantage of the goodwill caused by this announcement, a Czech photographer slipped into the British aircraft and got his pictures; and the ban was then re-applied before I could take advantage of the dispensation.

So I continued to take pictures on the ground, and to develop them at night. Processing difficulties made it impossible to develop more than two pictures at a time, and this, coupled with the effort

Ruzena Rybova of Czechoslovakia guides her steerable parachute to within 14 m of the centre of the cross after a descent from 1,000 m.

A Mig-17 turns steeply during the display with which the championships opened.

(Left) This remarkable pictorial formation was flown by Czech trainers and an An-2.

WORLD PARACHUTING CHAMPIONSHIPS . . .

of dashing from one place to another to discover why my reports and developed pictures, air-freighted to London, were not reaching their destination, made it necessary for me to refuse invitations to receptions that I would otherwise have been very happy to attend. With only one day of the competition left to go, and my copy still apparently lost en route, I asked for the hundredth and last time if I could take my pictures, and have facilities for getting them out of the country. I was told to ask the Ministry of External affairs in Prague, a five-hour train journey away. There was no further flight out of Bratislava airport to Prague that day, so I telephoned the British Embassy and explained the situation. I said that, apart from the difficulty of breaking down the State monopoly on air photography, there seemed to be very little relation between the air-freight timetable and the movement of the packages containing my reports.

The girl in the Embassy Press office was concerned, but not entirely optimistic. Something might be done, but the Ministry of External Affairs was probably closed for the rest of the day. She had a sense of humour, which was something of which I was fast running short.

Next day, permission to take air pictures was given, and the girl in the Press office at Prague gained an admirer for life. The pictures—when I got them—were not good ones; but if mine was not a triumph of photography, at least it was victory over adversity.

Next morning, clutching my pictures tightly, I became my own freight carrier and left for England by air. I landed at London airport that evening, and the reports and pictures that I had sent home six days before by that route arrived in *Flight*'s office the same day. Here, then, is the second half of my report.

Eighty parachutists—59 men and 21 women from Canada, France, Hungary, Rumania, Bulgaria, Russia, Czechoslovakia, Great Britain, Austria, America, Yugoslavia, Poland, Belgium and Israel—took part in the championships. There was, as might have been expected, a very noticeable difference in experience between the parachutists of the U.S.S.R. and its satellites, and those of the West. The former were all trained at the State's expense, while the latter—with the exception of the French team, which is only partly government-subsidized—were the result of private enterprise. As was shown in the first part of the competition—the spot landing from 1,000 metres—this is one sport in which State control really pays off. It does so, however, to the almost complete exclusion of any sort of fun.

The American team—well trained, well equipped and full of determination to win—had been grouping consistently well in the scoring area during the spot landing competition, but they lacked the precision of the men from the East. The British competitors had proved erratic in their shooting, sometimes landing outside the scoring circle completely, and sometimes within a dozen or so metres from the centre of the target. The sole Belgian competitor and the one-man team from Israel were also working on the hit-and-miss system. And so we came to the second exercise—the most difficult in the competition.

This part of the proceedings consisted of an individual (as opposed to a team) jump from an altitude of 2,500 m, with a free fall of 35-43 sec and execution of aerobatic manœuvres during the free fall. As in the other three exercises, two jumps were to be made.

Within five seconds of leaving the aircraft the competitor had to assume a swallow-diving attitude, face down, and with head pointing in the direction of a white arrow marked on the ground. At the tenth second of free fall one of three alternative signals was displayed on the ground, each signal indicating a group of manœuvres to be performed by the parachutist. The method of signalling was by opening for five seconds a sort of venetian blind arrangement covering various white panels laid out on the ground.

Immediately the signal was given the competitor had to begin his series of manœuvres. If he failed to pick up the signal in the five seconds allowed it was just too bad. The signals and their related exercises were as follows:—

A white bar to the left of the arrow and forming three-quarters of a cross: two left turns of 360 deg, one right turn of 360 deg, one left turn of 360 deg, two right turns of 360 deg. A white bar to the right of the arrow: one right turn of 360 deg, one left turn of 360 deg, two right turns of 360 deg, two left turns of 360 deg. A white bar on both sides of the arrow, forming a complete cross: one left turn, two right turns, two left turns, one right turn.

All these manœuvres had to be completed within 20 sec, that is, by the 35th second of the free fall. After every turn the competitor had to pull-out in line with the directional arrow on the ground. Although there was a time limit for the execution of the manœuvres, the total time to parachute opening did not count in the scoring, except that anyone opening a parachute before 35 or after 43 seconds was to be docked 50 points. Anyone opening a parachute below 400 m was to be disqualified, this last rule being introduced purely as a safety precaution.

A total of 150 points were available for the free fall, before the turn, with a fine of 5 points for every second's delay in taking up the right attitude and direction after leaving the aircraft, or after the completion of the turns. The other fines were as follows: Every second out of the horizontal position or correct direction, 5 points; vertical deviation, 5 points; back fall, somersault, spiral, spin or fall out of control, 150 points; and so on for another two closely written pages of the official rule book. Three telemeters, each manned by a crew of three trained operators, kept track of the falls, and the competition jury of F.A.I. representatives maintained independent watch through two more telemeters provided for that purpose. It is almost incredible, in a competition where protests were two a penny, that there was only one very mild query

(Upper) Anna Skopinova of the U.S.S.R. lands 1.67 m from the centre of the cross in Event 1, precision landing from 1,000 m. (Lower) Six from the West—Mike Reilly (Gt. Britain), Floyd Martineau (Canada), Denis Lee (Gt. Britain), Lee Whitehead (U.S.A. pilot), Sue Burges and Sgt. McLoughlin, R.A.F. (Gt. Britain).

(Above) The winners—Ostrovskij, world champion; Jehlicka (Czechoslovakia, second; and Milicevic (Yugoslavia), third. (Right) Jim Peterson of the U.S. team waits to make the final jump of the competition. At the last moment cloud obscured the target, and Peterson was airborne for two hours before he was able to jump.

about the decision of the telemeter judges—a very great compliment to their efficiency.

A quick examination of the results of this part of the championship is very revealing. It shows that the sport on a world championship level has passed almost out of the ken of the week-end parachutist, and is fast becoming an expensive and extremely scientific business. For instance, the first eight competitors in the two attempts at this particular exercise lost NO POINTS. They did, on the other hand, each gain between 50 and 70 bonus points for completing their turns ahead of time.

In the first attempt at the exercise the first thirteen competitors came through without loss of points. Of these only one, Milicevic, came from outside the sphere of direct Russian influence and training. Jacques Istel, captain of the American team, managed full marks for these two jumps, but gained a total of only 65 bonus points for speed of execution, against the 130 bonus points of the winner, Koubek of Czechoslovakia. Koubek's total score for the two jumps was 735, Istel had 665, and Rode of France, who was 14th in the result order (but who, because there were so many identical scores, actually tied for eighth place) had 675.

Although they are very experienced at free-falling, the rest of the French team came curiously far down the list. This, coupled with the fact that only they and two British competitors used non-steerable parachutes in the precision-landing events, spoiled their chances of getting into the first three in any of the four final titles.

The Americans—at this stage doing rather better than the French, from whom they had learned a great deal initially—were putting up an encouraging performance, while the British team, most of whom decided not to try the turns but to fall straight and lose marks (one can hardly blame them) sank gracefully to the bottom of the scoreboard. They were by no means dismayed, because it seemed that they were getting a good deal of amusement as well as valuable experience out of the championship. Members of the British team who did try to do the turns either lost count or did the wrong exercises. The British lowest individual score of 20 points was just 20 better than that of Tsachor of Israel, who returned a clean sheet. Sue Burges, who lost all points on the first part of the exercise, gained 40 out of 150 for her free fall in the second jump. Miss Bacaoanu of Russia led in this leg of the contest with 645 points, 90 less than the best male performance.

Taking my turn with other members of the competition jury, I lined up one of the telemeters on an approaching aircraft; and when, after considerable fruitless squinting into the hazy blue, I managed to locate an aeroplane, I applied the open sights to its broadest point, and then looked through the large and impressive lenses. The aircraft was carrying the Yugoslav team, and I watched fascinated as a tiny figure detached itself from the open door, and with arms spread started on the long trip home. With almost imperceptible movements of the hands and arms the body orientated itself to face along the white arrow beside me, and then there came the sharp double click of the venetian blind as the ground signal dictated the manœuvres that the falling body was to perform.

Before the second click—the closing of the blind—reached my ears the tiny figure was rotating rapidly and precisely thousands of feet above me, performing its evolutions as though on the end of an invisible wire. Then, suddenly, the arms moved inwards—one of them towards the rip-cord handle—and the body tumbled as the canopy streamed out of its pack. This certainly was a sport for young people, whose reaction time was measured in fractions of the smallest divisions on the dials of their stopwatches.

In the first of his two jumps Koubek gained 70 points for completing all his turns ahead of time. At five points per second ahead of time that means that he did not use 14 seconds out of the 20 available for the turns. Therefore, all his turns were made in six seconds, plus whatever he was able to save out of the five seconds for which his signal was displayed. Quite an achievement.

By now the organizers were really putting on the pressure in an attempt to get the competition finished, and the parachutists were, understandably, starting to tire. Judging from some of the remarks overheard in English this is perhaps an understatement, but the men from the East were all for pressing on.

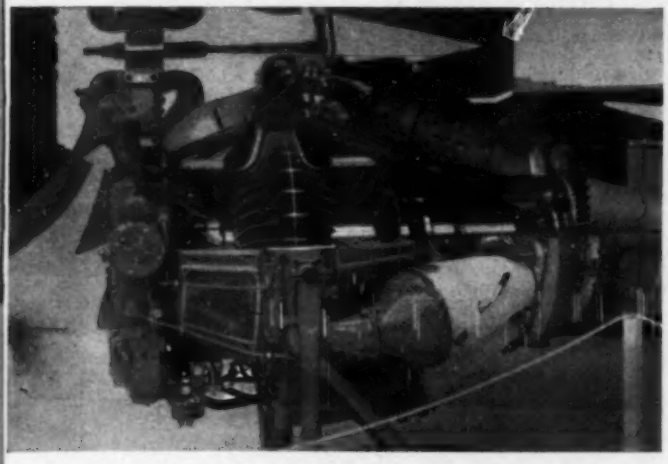
So the competitors were launched into the team jump from an altitude of 1,500 m, with a precision landing after a 15-23 sec free fall. There was no marking for style during the free-fall part of the exercise.

At the end of the three exercises now jumped, the Russian team was leading with 3,809.78 points, with Czechoslovakia second and Bulgaria third. These team scores were the sum of the three best showings per exercise per nation. America was a creditable fifth.

The last jump of the competition was the individual jump from 1,500 m, with marking for precision landing and style of free fall. The end was well in sight, and it was not an unexpected one. When the scores had finally been added up, the last protest made, and the teams prepared to march out behind their Czech flag-bearers to collect their prizes, it was discovered that Russia had won the team events for men and women, and both the individual championships. Ostrovskij became the new champion of the world, with Jehlicka of Czechoslovakia second and Milicevic of Yugoslavia third. Priachinova of Russia was woman champion, with Frankeova of Poland second and Valceva of Bulgaria third.

Let it be recorded here that the British team learned a great deal; and they learned it without losing their sense of humour or the determination to do their very best.

I do not begrudge them their day of celebration with the Kosmetik co-operative—and its charming chief chemist.



Sectioned Mig engine on show at the static exhibition—derived, as is well known, from the Rolls-Royce Nene/Tay series.

CIVIL AVIATION

AMERICAN TRAFFIC TRENDS

ALTHOUGH many economic pointers now indicate that U.S. business is climbing out of the recession it will be some time before air traffic statistics show whether or not fortune's wheel is turning favourably for America's airlines. Preliminary figures for domestic trunk airlines in June show that passenger-miles in that peak month were 2 per cent less than in June 1957. July traffic normally falls slightly from the previous month's level, but in August traffic rises to another peak. (This is followed by a steady fall until the winter vacation traffic starts to flow in mid-December.) Not until August figures become available in late September will this summer's traffic trends be evident.

One trend, however, can already be discerned: lower disposable incomes are driving passengers from first- to coach-class services. In the first six months of 1957 coach-class traffic accounted for 4,450m passenger-miles and first-class traffic for 7,510m. In the first half of this year, coach-class passenger-miles rose to 4,760m while first-class fell to 7,310m. This evidence of susceptibility to high fares comes at a time when the C.A.B.'s chairman, James R. Durfee, has said: "I do not know that increased fares will help to encourage the additional traffic that the airlines need."

Traffic results for each of the individual carriers are at present generally available only up till the end of April, and show that airlines have varied widely in their recession experience. Taking the months of March and April—when total traffic maintained the same level as in 1957—American and Eastern suffered slight losses while United and T.W.A. experienced moderate gains. Among the smaller domestic trunk carriers, Continental and Northeast enjoyed sharp traffic increases. As regards the international services, those to Latin America showed up badly (Delta, PanAm and Panagra suffering from a combination of economic recession and non-I.A.T.A. competition), but those across the Atlantic benefited from the introduction of economy-class fares. Traffic on PanAm's Atlantic services increased by 5 per cent over the previous April, while T.W.A. did exceptionally well by increasing their traffic by 33 per cent.

This confused experience is also evident among the other classes of American airline. Total traffic on local services has continued to increase, Bonanza and Frontier doing particularly well, but Trans-Texas registering traffic falls. Among the helicopter operators, Chicago Helicopter Airways have been expanding rapidly and have forged ahead of L.A.A. and N.Y.A., although the latter's traffic rose sharply in April with the introduction of Vertol 44s.

MR. BUTLER'S CARAVELLE PLANS

LITTLE has been heard of the activities of Mr. C. A. Butler since he resigned his chairmanship of Butler Air Transport earlier this year, following the acquisition of a controlling interest in his airline by Ansett-A.N.A.

Now Mr. Butler announces plans for a new Australian internal airline which, he says, will operate Caravelles. Speaking in Sydney on his return from a visit to Europe, he declined to say whether he had actually bought Caravelles; but he said that six would be in operation from 1960. Until that time he proposed to lease or charter three Britannias or Viscounts for service between Melbourne and Sydney before the end of 1958.

Mr. Butler said he considered the Caravelle "the only aircraft to be seriously considered for short and long hauls." But Mr. Butler is being optimistic in expecting the Australian Government to grant an import permit for Caravelles to an airline not yet formed when permission to buy Caravelles has been refused to the national airline, T.A.A. The Australian Government, in making that decision, did not rule out the possibility that T.A.A. might acquire Caravelles at a later date; their concern in the meantime was that Australia's domestic airline industry could not afford a diversity of types, and that it should not use equipment which might lead to an uneconomic speed-competition race. This same policy will surely apply to Mr. Butler's new airline.

According to the *Journal of Commerce and Shipping Telegraph*, Mr. Butler intends to build an "Australia-wide network competing with Ansett-A.N.A. and T.A.A." The new airline would probably "incorporate in its structure" Continental Airlines Pty., Ltd., registered in Sydney last February with the object of "operating some form of air service in Australia."

Important news for Napier is the granting of a C.A.A. type certificate to the Eland turboprop. Mr. L. Morda, C.A.A. aircraft engineering representative, presented the certificate to Mr. H. Sammons, managing director of Napier. In the centre is Mr. A. J. Penn, chief of the firm's Aero Gas Turbine Division.

After crossing from New York in only 6 hours 27 minutes, Peter Bugge, Peter Wilson, John Cunningham (from left to right, all de Havilland test pilots), Capt. N. A. Mervyn-Smith (B.O.A.C.), Capt. Ward and C. T. Forndell line up at Hatfield in front of the Comet. They had just made the first Atlantic crossing by a production jet airliner and reduced the previous best civil transport crossing time (established by a Britannia) by 1 hour 17 minutes.

A NOISY OVERTURE

IN a recent interview granted to *Sovetskaya Rossiya* Marshal Zhigarev, head of Aeroflot, had some bitter things to say about the British refusal to give the Tu-104 access into London Airport. "We were prepared to honour our commitments," he said, "but the British side put up obstacles . . . claiming that the Tu-104 makes too much noise. However, B.E.A. . . . do not share the authorities' point of view . . ." (Lord Douglas recently stated that exclusion of the Tu-104 "could easily harm Britain's position as one of the most important focal points of international air transport.")

Marshal Zhigarev went on to describe recent noise tests at Moscow: "The noise registered at a point four kilometres from the start of the run of an American DC-6 at Vnukovo was 105 decibels whereas the noise of the Tu-104 under the same conditions was only 103 decibels." He also said that no complaints had been received about the Tu-104's noise level, and quoted a number of Dutch, American and British journalists who testified that the Russian aircraft was no noisier than foreign aircraft.

Despite the Marshal's claim that the Tu-104 noise-level at take-off has been cut by five to 12 decibels according to load, the Ministry of Transport continue to attribute the delay to an absence of official data from Russia.

Writing in the August issue of the B.E.A. magazine, Lord Douglas asked that his earlier statement that "the hold-up has been due to the fact that the Ministry of Transport and Civil Aviation has not so far been able to accept, for scheduled services into London Airport, the noise level of the Tu-104 which the Russians propose to use . . ." should not be taken as implied criticism of the M.T.C.A. Until the Minister has had a reply from the Russians, says Lord Douglas, he obviously cannot be expected to make up his mind about Tu-104 acceptability.

SWISS CHEER

AT a time when most other European airlines are looking around for excuses to explain the fall-off in traffic development, Swissair report a 25 per cent increase in the first half year's traffic as compared with 1957 (45m to 56m l.t.km.). Passenger traffic rose by 22 per cent while freight and mail traffic increased by 36 and 31 per cent respectively. The freight increase is particularly remarkable, coming at a time when total Swiss imports fell by 17 per cent and exports by 6 per cent, the main improvement being felt on South American services (traffic quadrupled). On other routes Swissair's freight increased less rapidly—in Europe by 18 per cent and on the North Atlantic by 8 per cent.

But in other ways Swissair's results are less cheering. Total traffic carried in the first six months of this year was 5 per cent below the level for the second half of 1957. During this latter period, capacity built up to 97m c.t.km. and this level has been held through the present year. The average load-factor for each of the last three half-years has fallen steadily, from 62 to 61 per cent and then to 58 per cent.

Why TCA chose the VANGUARD for its medium-long range routes

- ✻ Remarkably low aircraft mile and seat mile costs
- ✻ High standard of comfort
- ✻ Freedom from noise and vibration
- ✻ No runway length or strength problems
- ✻ Complete confidence in Vickers/Rolls-Royce team
- ✻ Freight capacity

TCA AT 595

THESE ARE the specific reasons given by Mr. Gordon McGregor, President of TCA, when announcing the £23 million order for 20 Vanguards to operate on high density domestic and Southern service routes. TCA's decision was taken after a two-year evaluation, in which the claims of all comparable competing aircraft, jet and turbo-prop, British and American, were considered.

SUITABLE FOR MOST OF AMERICA'S BUSIEST ROUTES

Besides meeting Canadian requirements, the Vanguard could profitably serve over 90% of America's busiest routes. A recent airline evaluation has shown the Vanguard as having easily the lowest seat mile costs of any modern aircraft.

FOR AIRLINES WITH AN EXPANDING FUTURE

The Vickers Vanguard will take care of growing needs for years to come. It will appeal particularly to operators in search of the low air mile and seat mile costs that mean profitability.

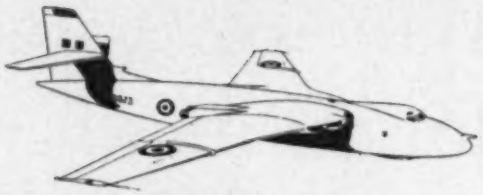
Airlines will be able to offer passengers greater comfort, the attractions of 425 m.p.h. travel and a background of 3 million airline hours handed on by the Viscount.

VICKERS VANGUARD

FOUR ROLLS-ROYCE TYNE PROPELLER-TURBINE ENGINES

VICKERS-ARMSTRONGS (AIRCRAFT) LIMITED WEYBRIDGE SURREY

FREEDOM OF THE AIR



No. 4 in a series of paintings by Keith Shackleton S.Av.A. presented by Cellon Limited

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Its rakish shape and colour makes the Flamingo unmistakable. A gregarious bird, it breeds in Southern Europe, in Spain and Mediterranean France, and southwards into Africa where colonies are found thousands strong. In Britain it is a rare visitor, but one which is obvious enough never to be missed when it comes.

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CIVIL AVIATION . . .

THE ELIZABETHANS PASS ON

FIRST pressurized aircraft to be operated by B.E.A., the Elizabethan made its last revenue flight with the Corporation on July 30, when the last service operated from Cologne to London. Deservedly popular, in the 6½ years from March 13, 1952, the fleet of 20 Elizabethans flew 178,000 revenue hours in B.E.A. service and carried 2,430,000 passengers at the high average load factor of 64.4 per cent. Some initial teething troubles and a later need for spar modifications kept annual utilization rather low, but the aircraft was developed to be very reliable and the 2,600 b.h.p. Bristol Centaurus engines achieved an overhaul period of 1,700 hr.

From Butler Air Transport of Australia comes news that, because of trade-in commitments, the company's three ex-B.E.A. Elizabethans were withdrawn from service on August 4. B.A.T. say that it was "a fine aeroplane—but one designed for international use." Its very small numbers "made for increasing difficulty in securing spare parts." It had an additional handicap for B.A.T. —one which it shared with the Viscount: "We could not use it on many of our airports." Of their Viscounts, which are being disposed of by W. S. Shackleton (*Flight*, July 25), B.A.T. say how sorry they were to see them go, but "of the 36 airports which we serve, only three have proved successful Viscount ports and we cannot keep two Viscounts to operate three ports."

ATLANTIC SWELL

THE first quarter of this year, before the advent of third-class fares across the North Atlantic, saw traffic increasing by a paltry 5 per cent while capacity leaped by 23 per cent. That this was due not only to the recession, but also to travellers waiting to take advantage of economy-class fares, is shown by I.A.T.A. traffic figures for the second quarter: the number of passengers rose by 25 per cent. Unfortunately, capacity was up by no less than 50 per cent, so load factor dropped from 73 to 61 per cent. This development cannot entirely be ascribed to over-enthusiastic scheduling, for it is partly the inevitable result of exploiting the more seasonal lower-income tourist market—while economy-class monthly eastbound load factors have risen from 58 to 87 per cent, westbound load factors have remained between 40 and 50 per cent.

First-class traffic in the second quarter was considerably higher this year at 70,452 than at last year's 60,230. The number of tourist-class passengers fell from 209,050 to 65,030, but this was more than offset by the carriage of 200,133 economy-class passengers. Total traffic for the quarter (335,615 passengers) comprised 199,119 passengers eastbound and 136,496 westbound.

Freight and mail traffic also increased, freight by 12 per cent to 5,160 tonnes (mostly westbound) and mail by 9 per cent to 2,402 tonnes (mostly eastbound).

While from a sales point of view these figures are encouraging from a financial angle they point to even lower profit margins. It certainly looks as if revenue is being outpaced by expenditure—and not, let it be noted, as a result of inflation.

DIFFERENTIALS AIRED

THE columns of two of Britain's serious weeklies have been fairly crackling with jet v. turboprop assertions during the past two or three weeks. First the *Economist*, taking its first steps on to the slippery ground of jet v. turboprop differentials, came down heavily on the side of the jets. It said that the prospect of jets had raised sharp cries of "unfair competition" from a number of quarters and "started a movement to penalize the jets by putting a swingeing 25 per cent surcharge on all jet airliner tickets." The journal also declared: "The difference in operating cost between the fast jet Caravelle and the slower turboprop Vanguard is negligible," adding that a jet surcharge was "unacceptable."

Could the *Economist* have been supporting B.O.A.C.'s attitude towards the differential? Certainly there is no other party in Britain besides B.O.A.C., with the presumed exception of de Havilland, which is as decisively anti-differential. The article drew sharp responses from the two main British turboprop protagonists —Bristol (over the signature of Mr. Peter Masefield) and Vickers (Mr. Charles Gardner). Mr. Masefield argued in this way:—

"The aircraft-mile costs of the larger jets are going to be substantially higher than in previous commercial aeroplanes. Thus, if traffic is limited, the net financial result of flying the large jets is bound to give an inferior financial return than the turboprops. . . . Without [the differential] the cost of obsolescence could put the air transport industry into a serious economic plight. It is a much bigger issue than just an argument on fares, it is indeed the future of an industry."

What *had* been discussed, Mr. Masefield wrote, was the operation of piston aircraft at fares ten per cent lower than the jets.

Mr. Gardner of Vickers pointed out that one particular airline had assessed the operating cost difference between the Vanguard and Caravelle at about 0.3d/seat st. mile less for the Vanguard [11.5 per cent] over 200- to 500-mile stages. This, he said, was not "negligible." Mr. Gardner suggested that the *Economist* had linked Vickers with the demand for a 25 per cent jet surcharge. "This demand," he said, "has come not from the manufacturers, but from airlines. We simply state that there should be a cheaper fare for the turboprop on short-medium hauls because it can be operated more cheaply. . . . Whether that difference be achieved by charging more for the more expensive jet or less for the more economic turboprop is . . . the affair of the airlines."

Finally, the Sunday *Observer* reported I.C.A.O.'s air transport committee (*Flight*, August 15) as saying: "All jets are slightly cheaper to operate than piston engine planes and turbojets are likely to prove more economical over long distances than turboprop machines like the Britannia." This drew the following reply from Mr. Masefield:—

"What the draft report says, in fact, is that 'it is probably safe to conclude now that on suitable stage lengths the unit operating costs of turbine powered aircraft will, in general, be somewhat lower than those of piston engine aircraft.'

"The very large American jets can be shown to have a theoretical cost per seat-mile marginally lower than the proven seat-mile cost of, say, the Britannia. . . . To say that the big jets may prove more economical is like saying that a bus is cheaper to operate than a taxi. A bus may be cheaper per seat-mile than a taxi if both are full. But the bus costs a lot more to drive from 'Charing Cross to Kandahar.'"

Of particular interest is the extent to which the fare-differential discussion is now coming out into the open. So far it has not been brought to the attention of Mr. Potential Passenger, except briefly in one recent well informed discussion in the *News Chronicle*.

B.O.A.C. STILL LOSING

IN the first four months of the current financial year (i.e., April to July inclusive) B.O.A.C. report a loss of £400,000 as against a budgeted profit of £200,000. Provisional, unaudited, undefined figures such as these can be taken to mean no more than that the Corporation is still having a very rough time.

B.O.A.C. traffic across the North Atlantic appears to have increased at a rate slightly above the general average for other carriers. But on the Eastern routes traffic is only slightly up on last year and on African routes traffic has fallen.

Looking ahead, Mr. Smallpeice (B.O.A.C.'s managing director) anticipates that Comet 4 deliveries will begin "towards the end of September" and hopes that this aircraft should go into service on the New York route "by about the beginning of December," on the Tokyo route "next May" and to Australia "in December 1959."

BREVITIES

S.A.S. has concluded an inter-line agreement with the national airline of Communist China. The agreement, which became effective on August 17, allows accounts to be settled directly in sterling and not, as before, through Aeroflot.

* * *

The Boeing 707-120 was awarded a provincial C.A.A. type certificate on August 15 pending the processing of flight test data.

* * *

Regional services operated by E.A.A. and C.A.A. between East and Central Africa will be flown in pool from the end of this year.

* * *

According to *Aviation Week*, American Airlines hope that overhaul life for the P. and W. JT3 (Boeing 707-120) will start at 800 hr; the C.A.A. is "holding out" for 600 hr.

* * *

Lord Douglas of Kirtleside has been presented with the Institute of Transport's Award of Merit for his 1957 Brancker Memorial Lecture on *The Economics of Speed*.

* * *

A Continental Viscount lost several turbine blades while flying over Nebraska on July 11. The aircraft was damaged but no passengers were injured.

Here, on the day scheduled two years ago, is the first AW.650 Argosy fuselage being moved from Armstrong Whitworth's Baginton factory to final assembly at Bitteswell, 19 miles away. The aircraft will be completed by October, and flown this year.

CIVIL AVIATION . . .

The Case for the Comet

A Review of the Prospects for Britain's Jet Airliner

By J. M. RAMSDEN

AFTER an elapse of four-and-a-half years the de Havilland Comet is about to resume British jet transport operations. The new Comet, a complete revision of the original, twice as powerful and with twice the capacity, will start operations during the next few weeks on the world's most highly contested route. This article takes a fresh look at the place of the de Havilland Comet 4 family in world air transport.

ONE of the themes consistently running through D.H.'s promotional efforts behind the Comet 4 these last two or three years has been: "A jet airliner of moderate size for routes of moderate traffic density." On a first assessment, this statement appears to be more a plain statement of fact than a telling sales-argument. Moderate size? But surely, one might ask, the historical trend of all airliner development to-date has exhibited *increases* in unit capacities—soon up to 150 seats—as the classic way of moving increased traffic most profitably. Routes of moderate traffic density? Why buy a jet for such routes, which can surely be dealt with by less competitive equipment? Do not jets make the best sense on competitive routes, which by definition tend to be routes of high traffic intensity?

Whatever may have been the justification for such questions in the past, they do not appear to be warranted today. By a combination of good luck and good judgment, the Comet 4 today appears to be the right-sized jet at the right time.

The word "moderate" when related to size is of course relative to the capacity-standards of the Boeing 707 and the Douglas DC-8. The number of first-class passengers needed by a Comet 4 to break even on a stage of, let us say, 2,500 miles, is probably about 25 or 30. By comparison, the number required by an intercontinental DC-8 or 707 on the same stage is of the order of 40 or 50. This suggests that, on routes of given traffic intensity, and assuming that each type of aircraft is scheduled at the same frequency, a Comet will *tend* to achieve loads greater than those required to break even more often than its larger-capacity competitors.

This argument does not necessarily hold good on routes where the traffic will stand large-capacity transports, where it might be found that the medium-sized Comet 4 was being operated at too high a load factor. In these circumstances more Comets might have to be scheduled to handle the given traffic volume and to avoid turning business away to competitors. Except on routes where higher frequencies are desirable—which is much less likely on long-haul routes than on short-haul routes—two medium-sized Comets might tend to be a less profitable way of meeting the traffic demand than one 707 or one DC-8. But there are clear signs that there are not all that many routes where traffic density is great enough, or is likely for some years to be great enough, to justify exploitation by large-capacity vehicles. There are, in particular, two such signs which might now be considered.

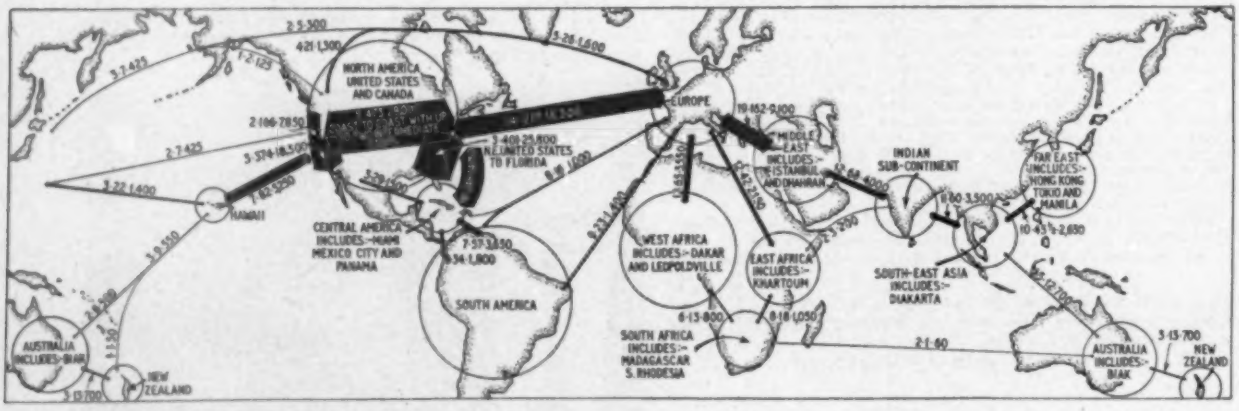
COMET FAMILY STATISTICS

Series	1A (Ghost 50 Mk 1)	2 (Avon Mk 117)	2E (Avons Mk 504 and Mk 524)	3 (Avons RA.26 and Mk 521)	4 (Avon RA.29)	4B (Avon RA.29)	4C (Avon RA.29)
Typical seating	44	44	44	56	74*	89*	89*
Static thrust (lb)	5,000	7,300	7,300 and 10,500	10,000	10,500	10,500	10,500
Span (ft)	115	115	115	115	115	108	115
Length (ft)	93	96	96	111.5	111.5	118	118
Height† (ft)	28.5	28.5	28.5	28.5	28.5	28.5	28.5
Wing area (Sq ft)	2,027	2,027	2,027	2,121	2,121	2,059	2,121
Total tankage (Imp. gal) ...	6,906	6,906	6,906	8,308	8,990	7,890	8,990
Maximum weight (lb)	115,000	120,000	120,000	145,000	156,000	156,000	156,000
Capacity payload (lb)	11,800	13,500	11,042	16,305	19,124	22,454	23,209
Max. still-air stage-length with full payload and reserve fuel (st miles)	1,770	2,535	2,240	2,800	2,720	2,240	2,270
Normal cruising speed (m.p.h.)	450	480	480	500	500	530	500
Average cruising altitude (ft) ...	34,000	38,000	38,000	38,000	36,000	23,500	35,000

Notes: Figures take full account of effect of noise suppressors on performance. *Mixed class. † Mean values; max. is 29.5ft at light weight.

during these years have also dropped (from 59.3 per cent in 1956 to 58.3 per cent in 1957), clearly indicating the extent of over-scheduling even with today's piston-driven fleets. There are signs in 1958 of an even greater fall in load factor. A fall of two points is generally more than sufficient to erase airline profitability; what will be the position when the 150-seat big jets are in service, and when the full effect of the airlines' financing commitments is being felt? This question has been the subject of much cynical gloom-mongering in the past year or two; suffice it to note here, in submitting the case for the Comet 4, that the air transport committee of the International Civil Aviation Organization have recently predicted a considerable surplus of capacity in 1960 and 1961 (*Flight*, August 15). And this surplus is forecast on the assumption, which must surely be optimistic, of a continued 15

This map, based on an original by de Havilland, shows the main air traffic streams in an average week of 1957-58. Each stream is labelled (e.g., 2-1-60) according, respectively, to the number of carriers, number of return flights per week, and seats offered each way each week. Summer and winter schedules listed in the "ABC World Airways Guide" were used except for North Atlantic figures which were those produced by I.C.A.O. for 1957, less those for the Polar routes, which are shown separately. Thickness of the arrows is proportional to seats offered. Significance of this map in relation to the Comet's prospects is discussed in the text on the next page.



The Comet 4 at New York International Airport, which it visited for the first time on August 10. Purpose of the visit was to confirm noise-acceptability tests previously made by the Port of New York Authority at Hatfield. It is hoped, as a result of these tests, that B.O.A.C. will be able to start Comet 4 services to New York this autumn. Within two years utilization will be 3,850 hr per aircraft.

per cent growth in traffic. All this could well lead to the question, which is being asked by many airlines today: "How are we going to fill our big jets?" Without sweeping fare reductions, which the airline industry cannot afford, and without the cancellation of orders, which may well happen, how indeed? It is this big question which gives meaning to the suggestion put forward earlier in this article that the Comet 4 is the right-sized jet at the right time. Of course it would be absurd to believe that airlines might cancel 707s or DC-8s and buy Comets; but there is nonetheless reason to expect that operators who have still to decide their jet programmes may be reasoning along the foregoing lines.

Earlier it was said that there are two signs that some route densities may not be sufficient to bear big-jet capacities. The first —to sum up so far—is that the rate traffic growth appears to be falling considerably behind the expectations for which the big unit capacities were ordered.

Second, as is clearly shown in the accompanying map, the world's main international air traffic streams are shared by a large number of carriers—too large a number, in some cases, for the economy of air transport as a whole. Second only to load factor as a measure of an airline's economic health is the density, i.e., load per route-mile, of its operations. While load factor is a vital index of revenue, traffic density is a critical measure of unit costs, and together these parameters are among the most important determinants of airline profitability. Much as students of air transport may criticize the fact that international air traffic is too thinly distributed among too many carriers or too many routes, it *is* a fact, and there are no signs that it will be otherwise for as far ahead as may be seen.

The further one carries this line of reasoning, the more apparent does the case for the Comet become. International air transport is constructed on the basis of bilateral agreements, the principle of which, quite simply, is: "You can fish in my stream if I can fish in yours." The result, as a study of the map reveals, is that the main international streams are widely shared.

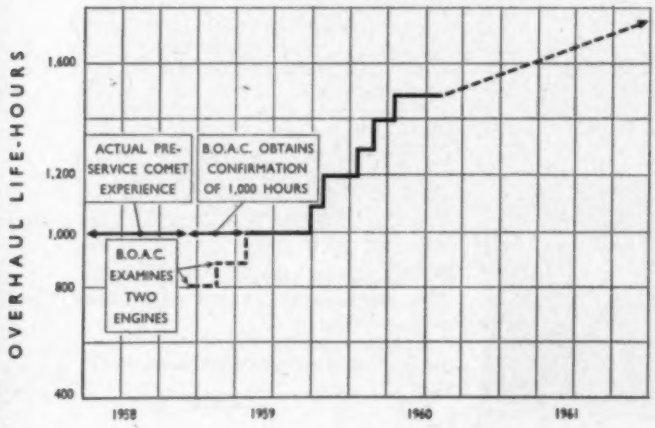
On the Europe-South America route. for example, nine airlines operate 23 flights per week with an average number of seats available of 61. There is an average of only 2½ flights per week per airline. Assuming that today's aircraft are the right size for the traffic, and that traffic continues to grow at the present rate, there does not appear to be much justification for an aircraft larger than the Comet for some years to come.

It is instructive to examine other traffic streams in this way. If one takes as a standard the intensity-per-carrier of the trans-American stream (which is, incidentally, one of the few on the map subject to economic regulation), it appears that the North Atlantic is about one-sixth as intensively operated in terms of flights per week per carrier or seats per week per carrier; the Europe-Middle East route is about one-twelfth as intense; while the rest, to a varying degree, are considerably less intensively operated. All this suggests that, if high intensity and frequency of operation are the objectives of international operators, the case for a medium-sized transport is a strong one.

It is a fact, moreover, that the tendency in the airline angling club is towards a wider distribution of the catch. The past year or so has seen, for example, the rise of new operators like Olympic Airways, Austrian Airlines, Ghana Airways, and Aer Lingus. Though welcomed, and indeed given a helping hand, these and other newcomers nevertheless contribute to the diminution of traffic densities. So long as this tendency exists there is further reinforcement of the case for a medium-capacity transport on the international trunk routes. Furthermore, the greater the number of carriers, the hotter is the competition for the available traffic, and hence the need for a jet. The syllogism is completed by the suggestion that the Comet 4, as the only medium-sized jet available for medium- and long-haul trunk routes, is the one jet transport which appears to make sense. And when one further considers the evidence, previously discussed, of declining traffic growth-rate and load factor, the case for the Comet as "a jet airliner of moderate size for routes of moderate [i.e., thinly distributed] traffic density" appears in a new light.

The selection of the right size and traffic capacity is, however, but one of the factors influencing an airline in its choice of new equipment. In terms of cost per aircraft mile, which can be a decisive measure of economy when seat-mile costs depend upon the ability to *fill* the seats, the Comet shows up better than its bigger rivals. In terms of speed the Comet is undoubtedly slower, but perhaps not penalizingly so: a difference of 50 m.p.h. in block speed is probably not sufficient to outweigh the appeal of jet travel, which at any speed is sufficient to attract business. In most of the other important factors affecting an airline's choice, the Comet appears to be well placed. Deliveries can be made next year; and it would be difficult to put too much emphasis on the fact that no other new aircraft will enter service more fully developed and tested. The extent to which the new Comet has benefited from the experience of nine years' flying and operation was described in *Flight* of March 28 last. Since then the Rolls-Royce Avon 524 powerplant has been cleared for a thousand-hour overhaul life (see graph, left); B.O.A.C. have completed their 4,000 hr Comet 2E proving and training programme; R.A.F. Transport Command have completed their second year of Comet 2 operations with a total of 14,000 hr; and B.O.A.C. have announced plans for the inauguration of Comet 4 services across the North Atlantic this autumn. The Corporation has also indicated that within two years of introducing Comet 4s, the utilization of each of the fleet of 19 will rise to 3,850 hr, a figure which gives some measure of how much is expected of, and how much depends upon, the Comet in the next few years.

AVON OVERHAUL LIFE FORECAST



Straight and Level

RE-READING B.O.A.C.'s report and accounts for the year 1957-58, I idly did the following sums. If B.O.A.C.'s load factor had come up to expectations the Corporation would have made another £3.5 million. If their unit engineering costs had been comparable with those of, say, K.L.M. the Corporation might have saved roughly a further £7.5 million. If the unexpected cost of introducing new aircraft had not been incurred, they might, according to the chairman, have saved "several millions" (let us say, to be on the conservative side, £2.5 millions). If B.O.A.C.'s associates had broken even instead of making a net loss, another £0.5 million would have been saved. If B.O.A.C. had disposed of their four surplus Constellations and two Argonauts at a good price they might have made another £1.5 millions.

If all these things had happened, B.O.A.C. would have made a profit of £12.7 millions instead of a loss of £2.8 millions. Did the Corporation need to make so many excuses?

● Billposting is a skilled job. A good man can slap huge sheets together so accurately that the lines coincide within an eighth of an inch—no more than the distortion within the paper. I am reminded by this of the good old days of aircraft building, when the same tolerance—rather a lot for a metal structure—was by no means uncommon in making an airframe. Every airframe fitter knows how easy it is to get rivet holes out of alignment, and what easier way out than to drill a new one? A lot of aircrew were unpleasantly surprised during World War 2 to find out how badly some aircraft could be made. Only during the past decade has jigging really done its job, and only when the speed is supersonic does the vehicle have to be made with a micrometer.

Arising from this is the unpalatable fact that supersonic airframes cost a lot of money. As an example it is possible to cite the experience of Convair, who are one of the more efficient of the world's frame makers. The hulking B-36 structure cost the American taxpayer a cool $1,969,271 (B-36J, in production). Yet the much smaller F-106 fighter airframe costs about $2,955,000 and the supersonic B-58 has the awesome price-tag—again for the bare airframe, without any engines or equipment—of $50,340,613. Admittedly the latter figure would drop in full production, but it indicates how much our supersonic airliner is going to cost us.

● Sometimes, when something inexplicable happens, you can work out *some* sort of explanation. Not in the case of American Airlines' order for 50 more jets.

Imagine a man who, having pestered his boss for a rise every day for a year, and having carefully built up a convincing case of real hardship, suddenly ordered six Bentley Continentals. To me, and probably to the C.A.B., the American Airlines order makes about the same sort of sense.

● Steam is today regarded as a word epitomizing all that is archaic; hence steam radio. May I point out that, in fact, the stuff that James Watt set to work is really on the up and up. Gas-turbine technicians may feel very superior to be dealing with a working fluid at 1,700 deg F, and regard the steam-turbine designer as a man who uses the stuff that comes out of a kettle. Actually the best electric power station can beat the best gas turbine on almost every count—except the obvious one of power/weight ratio.

For the record, steam conditions at a power station in Ohio are 4,500 lb/sq in and 1,170 deg F, and the forthcoming Eddystone station will operate at 5,000 lb/sq in and a correspondingly higher temperature. This sort of steam is really frightening, and olde worlde stuffing-boxes and gaskets just won't do. Even at much lower pressures and temperatures steam is used to drive 70,000-ton carriers and launch their aircraft, and it is even employed to fire the Polaris ballistic missile. And, should there ever be a nuclear-powered aeroplane, that also will probably be driven by steam, like today's nuclear submarines (in which the reaction acts simply as boiler-fuel).

● One of my favourite noises is that of an airliner door being closed. One minute there is all the pandemonium of the apron at a busy airport; then comes the welcome thud and I am sealed off from sound, climate, telephones, responsibility and all the tribulations of modern life. At once I am in another country. And (just to be perverse) the thud is particularly welcome when it shuts off the sweltering heat and flies of the tropics and leaves me inside eighty tons of Britain.

● What a fuss about the Air League's proposed memorial to the R.34 airship! Quite obviously, people do not understand. They "know what they like," but they do not *understand*.

I say without hesitation that this sculpture is an example of *zerschtrampfenfürtnang* at its most dynamic. It quivers with sublimated anti-expressionism, and yet it nimbly triumphs over the *ad captandum vulgus* which is so lamentable a feature of modern man's corrosive proselytizing today. What more can I say?

● I feel uneasy about airlines racing new equipment into service; but whether PanAm or B.O.A.C. gets jets into Atlantic service first, the following facts need stating now. B.O.A.C. have flown 425 Comet hours in transatlantic proving flights and crew-training; the B.O.A.C. Comet Fleet has flown nearly 4,000 hours of proving and training since last September; the Corporation's experience of scheduled jet operations amounts to nearly 30,000 hours.

Although you can be sure that PanAm would never hustle without prudence, it is nevertheless certain that their preparations for transatlantic Boeing 707 jet services this autumn cannot be more thorough than B.O.A.C.'s Comet 4 preparations.

● *Flight* to de Havilland spokesman: "Now about these Comet 4 noise tests at New York. . . ."

D.H. spokesman: "Noise tests? *Noise* tests? You mean quietness tests, don't you?"

ROGER BACON

Commentator at the end of the Leinster Aero Club display: "Will Mrs. Pennyweather's party of schoolgirls please go to gate B, where their bus is waiting?" Pause. "I repeat, will Mrs. Pennywe . . . Girls! GIRLS!" But, as you will know if you read page 235 of last week's *Flight*, it was too late. Unable any longer to suppress their desire to fly St. Trinian's were on the rampage, and that poor old Tiger Moth will probably never be the same again.

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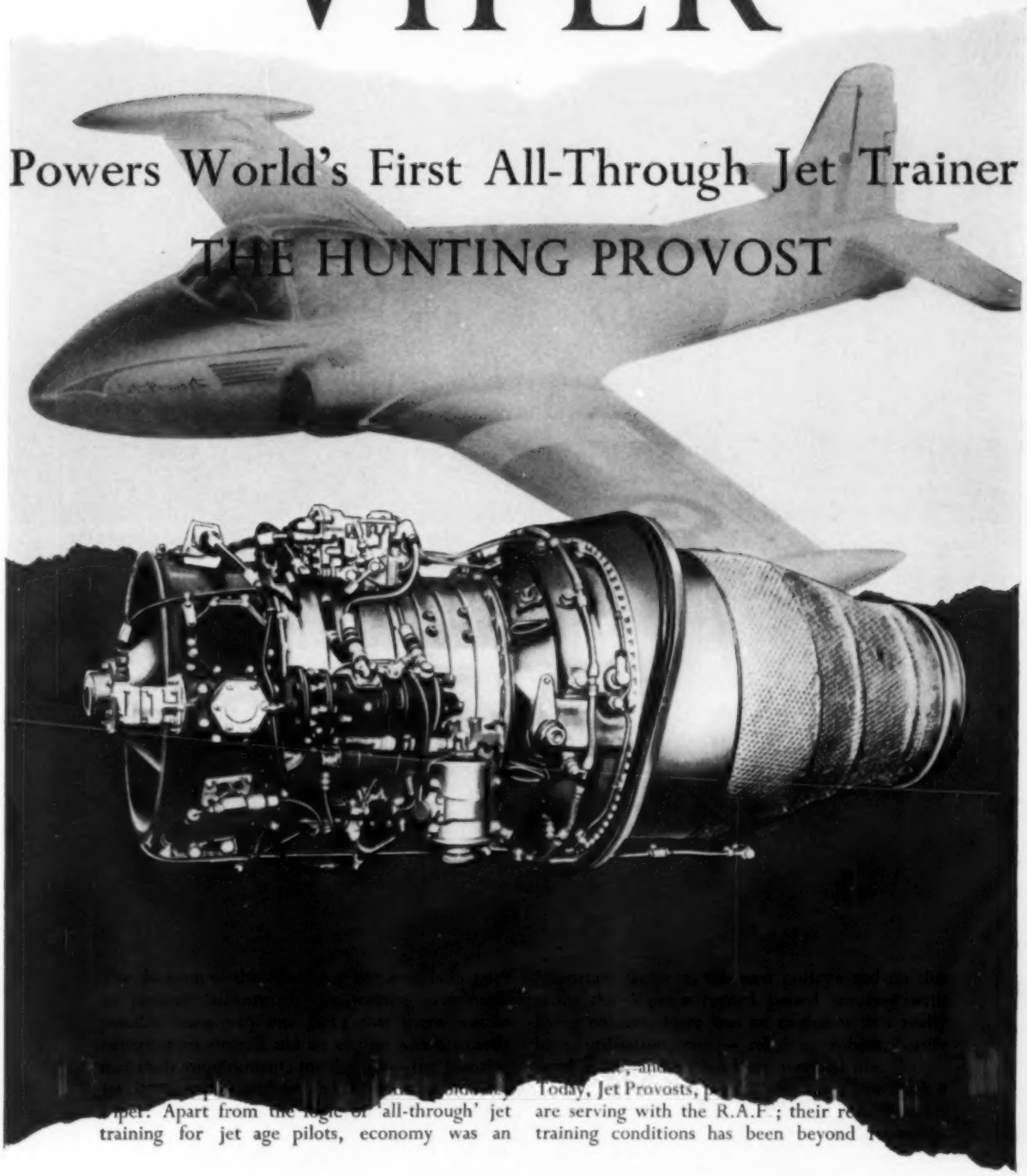

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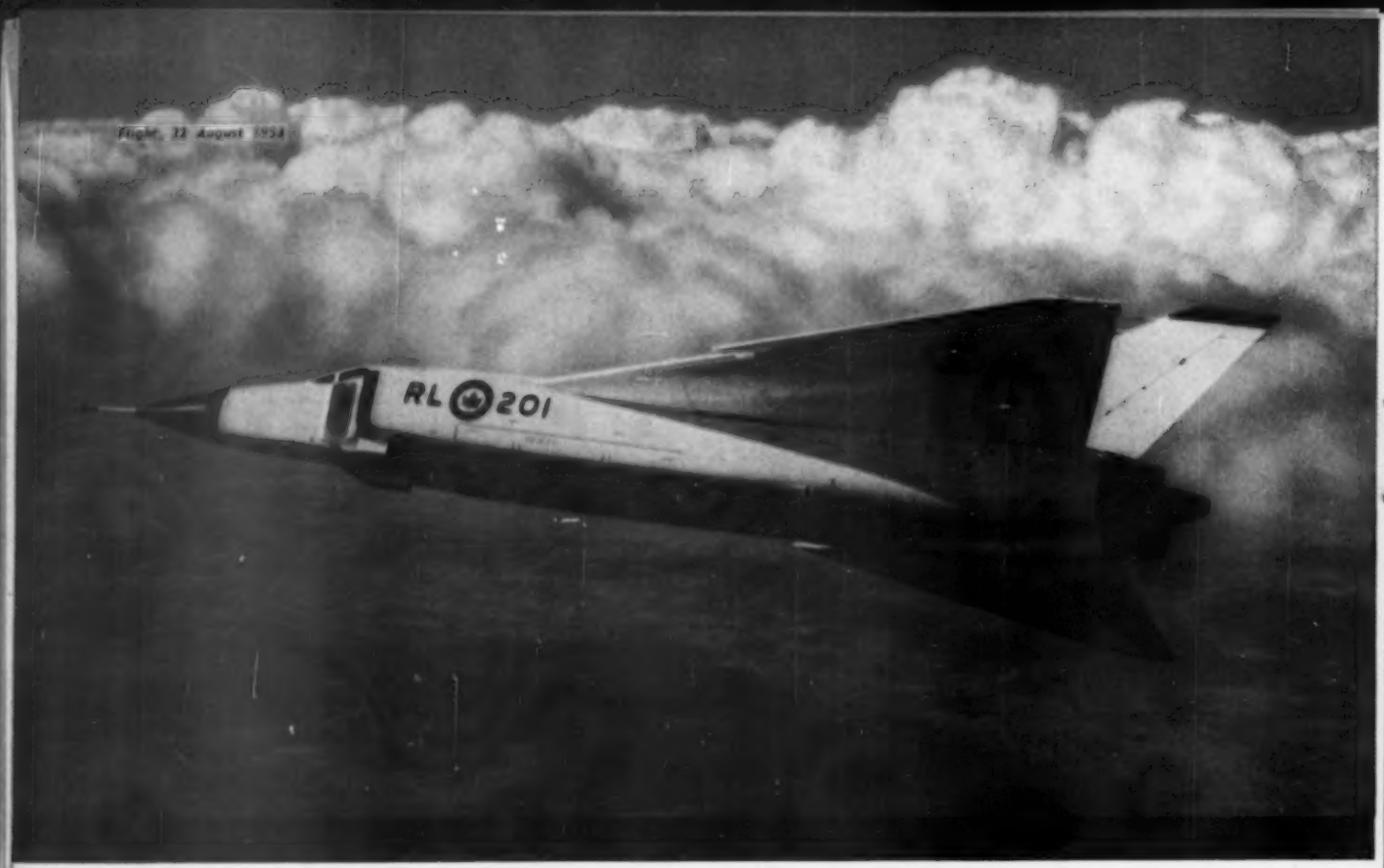
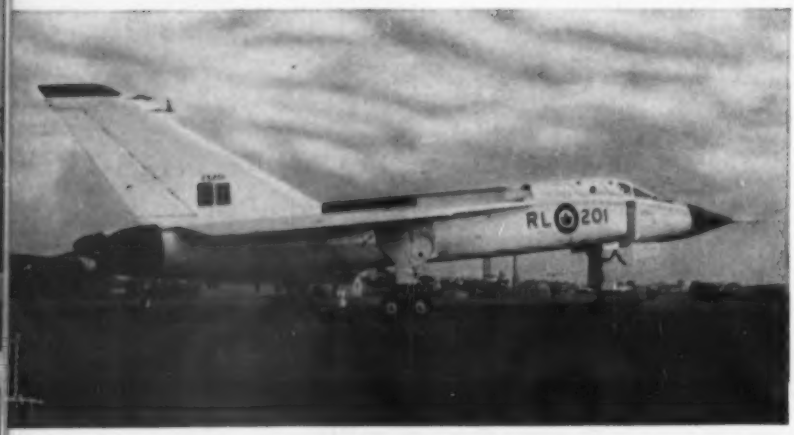


▲ The Avro Arrow is shown in flight during test manoeuvres over Ontario.

The Arrow weapon system is a bomber-destroyer having supersonic mission capabilities. ▼



The Avro Arrow is as big as a World War II bomber yet took off on its first flight in only 3,000 feet of the 11,000 foot runway at Malton. ▼

AN ARROW IN THE SKY

Since its first flight on March 25th, the Avro Arrow has been meeting the vigorous demands of its extensive flight test program. Proceeding according to plan, the Arrow flew faster than sound on its third flight, and more than 1,000 miles per hour on its seventh flight.

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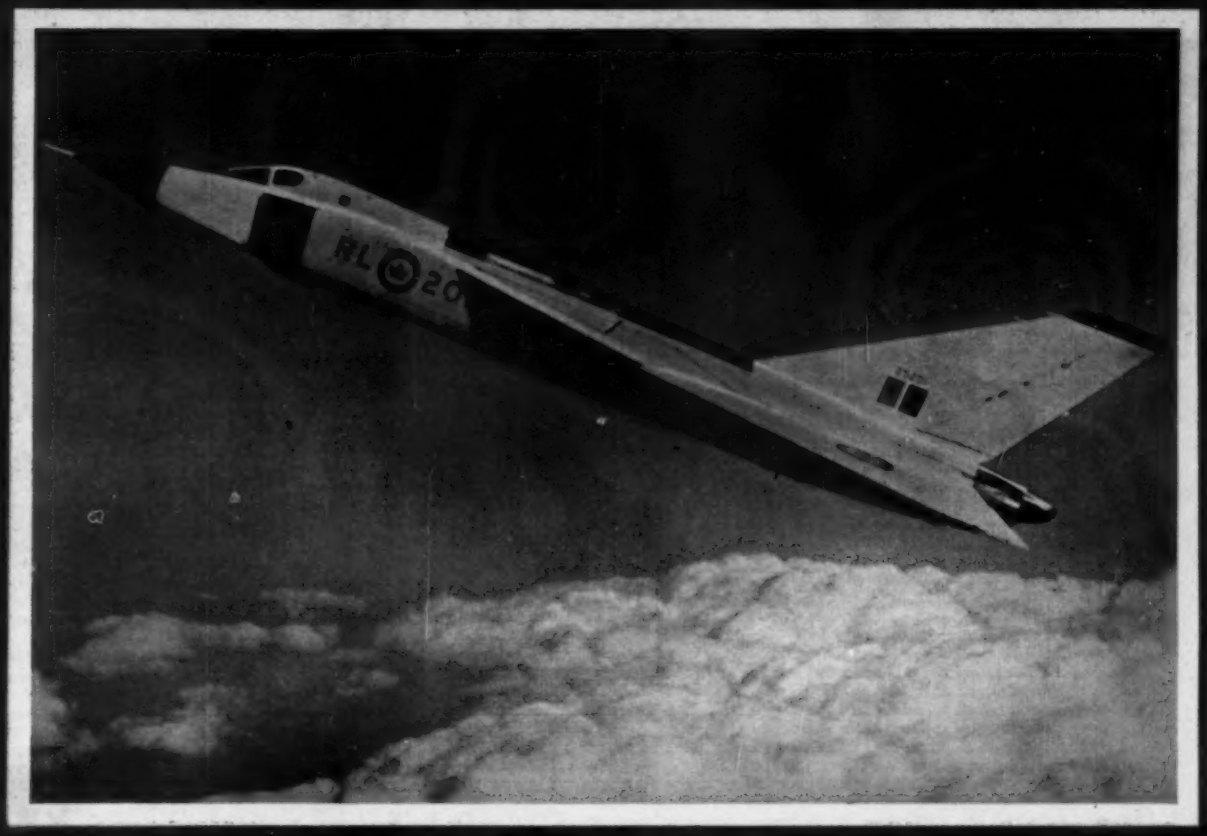

For the fifth successive year the major section of "Flight's" pre-Farnborough issue is devoted to a review of aviation in the countries of the British Commonwealth. This past year has produced a fair crop of new aircraft—two from Canada, the mighty Arrow and the agile Caribou; and two from Australia, agriculturalists both, named Ceres and Cropmaster. But the aircraft industries of the Commonwealth countries have their problems, also, as would be expected at this time of transition for aircraft companies the world over. In the following pages appear detailed reports of industry activity during the past twelve months, together with general feature articles concerning the overall air-transport scene, the important Wheatcroft Report on Canadian airline competition, and contrasting aspects of Canadian flying.

Aircraft *versus Forest Fire*

BY KENNETH OWEN

BRITISH COLUMBIA'S FIGHT AGAINST A HOT, DRY SUMMER

ON the morning of my first day in Vancouver, a few weeks ago, I sat in an office overlooking the city's airport and could smell the tang of woodsmoke. The next day I watched two Beavers taxi into the seaplane base half an hour after sundown, after a 14-hour day of fire-fighting effort. The day after that I looked down from a Mallard amphibian over Vancouver Island at the dark smoke haze in which the island's mountains were almost submerged. And not until the day after that was I able to find the staff of the district forester in their office with enough time to spare, in between urgent telephone calls, to talk about their problem. Their problem, in short, was the worst year for forest fires in the history of British Columbia . . .

A typical day's flying in support of the fire-fighting operations was described to me by Roy Moulton, a Beaver pilot for Pacific Western Airlines, over a thick coffee in the P.W.A. seaplane terminal immediately after his return. The time was 9.30 p.m., and it had been 6 a.m. when he had taxied out from the dock that morning, accompanied by two forestry service officials.

His first job had been to fly to Harrison Lake, where ground crews were trying to control fires covering some 5,000 acres. One of the forestry men was going as general supervisor at the Harrison fires, which were reportedly threatening to spread out of control. Having delivered the supervisor to Harrison, Moulton took off again immediately for a patrol flight during which Don Owen, the second forestry official, was able to examine the extent of the four main fires in the area and also to check two spot-fires which, caused by lightning strikes, had not yet spread.

One sizeable fire in the region was at that time receiving the attention of a West Coast Air Services Beaver piloted by Jack Stelfox and specially fitted with float-tanks. These tanks, quickly filled in a few seconds simply by taxying along between landing and take-off, were capable of dropping 86 gal of water in a heavy spray. This machine was being used to confine the fire to its existing area, and was working extremely hard. A quick patrol by Moulton's Beaver showed the forestry observer that so far the fire was being held effectively by the aircraft. Ground fire-fighting crews were at that time needing transport up the lake to the east-shore scene of the actual fire and, as all the available boats were in use, the Beaver was called down to take the men aboard and move them over.

Moulton and Owen then fixed themselves some breakfast.

Further crew-movements and fire-patrolling followed, into McDonald Creek, Cultis Lake, the Chilliwack area. Then back to Vancouver to pick up parachute equipment. Then a 200-mile flight to Alert Bay, to load up with food, equipment and fuel supplies which were to be dropped to a 30-man crew fighting a large fire on the Adams River which straddled the 49th Parallel—U.S. crews were fighting the same fire along its southern edge. Then the parachute drops themselves, which took up most of the afternoon.

Since seven o'clock the Beaver had been working towards home, patrolling further fires in South Vancouver Island and making a follow-up reconnaissance after news of a lightning strike, reported by a fisherman to the local forest ranger, had been relayed by radio to the aircraft. The day's flying had involved an operating radius of 250 miles, about ten hours in the air and eighteen landings, Roy Moulton declared, and the coffee tasted good.

That was just one pilot's day—one day in the fantastic month of July, which ended with some 350 fires still burning in British Columbia. Many of these covered several thousand acres apiece and one, 50 miles north of Prince George, covered no less than 30,000 acres. Fire-fighting costs for May, June and July approached two million dollars; direct losses in timber, crops and lost wages amounted to $26 million; and *The Province* of Vancouver reported on July 30 that "the final scorching bill may easily top $40 million as dried-up streams and high water temperatures threaten heavy losses to the $15 million pink-salmon run."

In an attempt to cope with this desperate situation, the operators at Vancouver Airport were not only flying regular patrols and supply flights for the Department of Lands and Forests but were experimenting with new techniques. As mentioned, West Coast Air Services were using twin water tanks fitted to the floats of one of their Beavers. West Coast were the pioneers of this system in last month's emergency: the tanks come as a standard de Havilland Canada kit but, although widely employed in Ontario, were unfamiliar in the Vancouver area—an ironic fact.

Previously the most-used method of water application from aircraft was by dropping water bombs—plastic or waterproof bags holding 3½ gal of water each and weighing about 30 lb when filled. The main disadvantage of this technique was the time lost in reloading in between drops.

West Coast had achieved a notable success on their first attempt, a few days before, to fight a forest fire with the aid of the new tanks. This had been at Hotham Sound, in the Jervis Inlet area, where the water-dropping aircraft had succeeded in extinguishing a five-acre fire. In the Buttels Lake area on Vancouver Island, and now at Harrison Lake, a second type of operation had proved equally successful—the holding-down of the larger fires to a given size, while ground crews set up fire-breaks.

That night the tank-fitted Beaver returned soon after 9 p.m. and was towed immediately over to the company hangar for a 100-hour check (50 hours had been logged in the last four days) and the addition of company-devised nose and tail cones to the tanks, which it was hoped would improve the Beaver's cruising speed. At 5.30 next morning the machine was airborne again from the Morray channel of the Fraser River, and other companies on the airport were in the process of fitting similar tanks to their aircraft.

Across on the other side of the airport terminal building is the head office and hangar of Okanagan Helicopters, and they, also, had a particular rôle in the district's fire-fighting effort. The company's big S-58 helicopter CF-JIB had been busy transporting men and equipment to fires in the Squamish area, flying up Howe Sound to the north of Vancouver. Part of the load for the following day's 7 a.m. flight was already in the machine; it included pumping equipment, lengths of hose, and cases of food.

The pilot of the S-58, Fred Eilertson, confirmed that he and the machine had had a busy time. A typical day's operations had

logged almost 10 hours' flying and about 25 landings, the highest of which was at 6,500ft. While the high landings had been made above the timber-line, the majority were in dried-up creek beds, on muskeg, or in other clearings near the scenes of fires. The helicopter's capabilities had been employed not only in transport work from Vancouver but also in moving men and equipment forward (from the points where they had arrived by fixed-wing aircraft, for instance) to the advanced fire-fighting camps.

Okanagan, too, were in the water-tank business. Alf Stringer, the company's operations director, showed me the 200-gal tank (previously forming 50 per cent of a Lancaster fuel tank), with ten-inch gate-valve, which had been devised to fit into the main cabin of the S-58. When time permitted, this was to be air-tested and would then be available for forestry-department use.

The forestry-department officials, as can be imagined, were the men with the biggest headaches. If they could not be contacted at their sixth-floor office in Vancouver's Marine Building, it normally meant they were out flying over the fires themselves—pushing parachute-drop equipment out of the rear floor-hatch of a Beaver; seeing just how effectively an area was being controlled; taking 60-second-print photographs with a Polaroid Land Camera of particular fires to enable new action to be planned; and seeing for themselves how the overall picture looked and how best to use the aircraft available.

The overall picture looked pretty bad. The foresters were glad of all the aircraft they could use, and they were using just about all the aircraft that were available. The district forester for the Vancouver area, Mr. D. B. Taylor, is a progressive forestry man with a particular enthusiasm for the use of aircraft—so practical an enthusiasm, indeed, that I failed to find him at his office at all during my four days in Vancouver. His staff include L. B. Boulton, assistant district forester; J. H. Holmberg, in charge of the Protection Division; and his assistant Don Owen, and it was the latter two men who sketched for me briefly the background to the Province's use of aircraft against fire.

The Vancouver district is one of five into which British Columbia is sub-divided for forestry purposes, with overall control by the chief forester at Victoria. The other district foresters are located at Prince George, Prince Rupert, Kamloops and Nelson. In each district the forestry department uses aircraft in two basic ways: a fixed number are employed on forestry work on a regular contract basis, and these are supplemented as required by *ad hoc* charters of additional machines.

Both fixed-wing aircraft and helicopters were being used. The only helicopter operating in the Vancouver district was Okanagan's S-58, while four Pacific Western Bell 47s were flying on forestry work in the other districts of the Province. Joint operations were planned to obtain the most effective use of the respective types.

Normally Vancouver district's contract Beaver would fly about 400 hours during the summer season. After a fair amount of rain during June, mid-July to the end of August would be the normal season for forest fires. The Province's incredibly long, dry spell of hot weather this year was quite exceptional, and had had the double effect of thoroughly drying out the wood and producing an exceptional amount of lightning activity.

Lightning strikes were one of the main causes of the fires. At times these could not be detected, even by air, for several days, and even if they were detected it was often impossible to reach them in time to prevent the localized strike from spreading into a large-scale fire. For two days a small fire in the Strathcona Provincial Park region of Vancouver Island held its size but could not be reached—a float-equipped helicopter, if available, might have proved the answer—and now, covering several thousand acres around Buttle Lake, this fire was one of the worst in the district. The previous day 30 men had been evacuated from a small island by boat and aircraft as this fire spread towards their camp, and the island had been completely burned out.

As lightning strikes were often extremely difficult to spot from the air, it was not considered worthwhile to fly continuous observation patrols. Although a number of strikes were in fact being reported by pilots, the more usual technique was for initial reports to come from ground look-outs, after which aircraft would make follow-up investigations. Radio reports from the 36 lookout stations in the district were being received at the forestry department's radio headquarters station on the north arm of the Fraser River. Efficient portable "handie-talkie" sets were being used for local communication between ground crews, forestry officials, aircraft pilots and all concerned in the fire-fighting operations—with no fewer than 250 of these sets being operated in the Vancouver district alone.

The previous day's report for the Vancouver district had said, "Twenty-three new fires have broken out, some of which are now under control. Seventy-nine fires are burning, and 850 men are fighting them." In one ranger district alone (there are 27 forest rangers in the Vancouver district), at Squamish, there were four fires each covering between 3,000 and 6,000 acres. And the same story was being repeated in other areas, particularly near Prince George and Prince Rupert.

There was simply no hope of extinguishing all these fires. All that the forestry department, the aircrews and the ground crews could hope to do was to prevent the large fires from spreading further, to watch the small ones, and to put out those small ones which appeared dangerous. While the dropping of a calcium sodium borate spray from Stearman aircraft had been tried earlier that month as a fire-retarding technique, the concentration had not proved great enough to be effective. No substitute had been found for the clearing of conventional fire-guard strips ahead of a fire by caterpillar-tracked bulldozers.

British Columbia's timber industry is by far the biggest industry in the Province, and the effect of widespread forest closures is obviously extremely serious. At the time of my visit complete forest closures were in force in the Vancouver and Prince Rupert districts, and logging was limited in the remaining three areas. In addition to the high-quality timber that was being destroyed, such as the Squamish-Elaho-Ashlu drainage area ("which takes 30 minutes' flying time by Beaver to cross from one end to the other," Don Owen pointed out), the scenic forests of Strathcona Park on Vancouver Island were involved in some of Vancouver district's worst fires, including the 4,000-acre blaze involving valuable Douglas fir at Buttle Lake.

From the air, as I had seen for myself only the previous day, the valleys of central Vancouver Island had been full of the thick grey smoke-haze, with only the tops of the mountains rising through. The haze had been everywhere, masking even the coastal mountain range as seen from Vancouver Airport on my first day there.

British Columbia has over 100 million acres of forest land, of which over one million acres, it was estimated, had been destroyed by fire during July. Since the beginning of the year there had been 2,500 fires, and the men fighting the 350 fires which were now burning numbered 2,900.

The equipment used included 90 bulldozers, 20 float aircraft and six helicopters—with offers of more aircraft coming in while I was in the district forestry office. The aircraft had *not* provided an easy solution and a happy ending for B.C.'s story of disaster. Only a marked and sustained change in the weather could do that. What they had done was to provide quick communication, transport to isolated and inaccessible sites, and the fastest method of applying water to a limited fire area.

Vancouver was lucky to have its bush pilots, its Beavers, its helicopters. Companies such as B.C. Airlines, Pacific Western, Okanagan and West Coast Air Services had given an indication that, while the DC-7s, Viscounts and Britannias of their larger brethren on Sea Island might be the biggest machines on the airport, they were not necessarily the most important. B.C.'s centenary year had proved an emergency year, and suitable aircraft had been there to help.

(Left) The moon is up as West Coast Air Services' tank-fitted Beaver returns to Vancouver's ramp after a hard day's forest flying. (Right) Looking down on the thick smoke haze enveloping the valleys near the 5,000-acre fire at Buttle Lake, Vancouver Island.

"Flight" photographs

Second Avro CF-105 Arrow being prepared for ground engine-run at Malton.

The Canadian Industry

THE strength of Canada's aircraft industry has been built on a triple foundation: the efforts of three main organizations with differing fields of endeavour. The Avro group has designed and built intercepter aircraft tailored to Canada's own requirements; Canadair has demonstrated its mass-production ability with developed versions of other people's aircraft; and the practical utility aircraft of de Havilland are operating in all parts of the world where facilities are few and the flying is hard. In the background are the many hundreds of supporting companies whose efforts have helped to make the industry self-supporting.

In a problem year for aircraft industries everywhere, Canada's big three have each produced new aircraft with promising futures. The consequences of changing governments in mid-stream during the development period of a number of defence projects have included delays and uncertainty both in broad policy and in specific programmes, but a number of trends are now discernible. It comes as no surprise that the general tendency towards diversification of activity has continued almost everywhere.

Informed opinion in Ottawa is that the government is facing more major defence decisions now than at any time since the outbreak of the Korean war in 1950. Among the main problems, three are concerned with aircraft or missiles. Top of the list is the question that affects hundreds of firms in the aircraft industry—whether to order into full production the Avro CF-105 Arrow bisonic all-weather intercepter. A second question is whether to install Bomarc anti-aircraft missile bases in Canada and, if so, whether to manufacture this U.S. weapon in Canada. A third is the possible purchase of ground-to-ground and anti-tank missiles for the Canadian Army.

The Arrow question is the one that dominates the scene. As indicated on page 263, the CF-105 programme is a most expensive one, and about $387,000,000 will have been spent on this project by the end of next March. The present position is that 37 pre-production machines have been ordered. For the Canadian industry the Arrow is its most ambitious project yet.

In fact it appears certain, or as certain as anything can be which involves the manifold aspects of politics, that a production order for the Arrow will be placed. The question is then the size of this order, a question that depends on a number of complex factors for its answer. With the R.C.A.F. requirement as a starting point, the other factors include dollars (inevitably), the number of machines for economic production, the decision on Bomarc, and the extent to which it is considered in the national interest to provide continued work for the industry. In turn the decision as to whether to adopt Bomarc missiles depends on a delicate balance between financial and political considerations.

Decisions on these interacting problems, Canadian critics have said, have not been organized into a constructive overall government policy, and this lack of policy has made life difficult not only for the major companies but also for the many ancillary manufacturers whose components form part of the aircraft concerned.

Another balance-striking decision affected by finance and timing was the cancellation last autumn of the missile-firing CF-100 programme, intended as a half-way step between rocket-armed CF-100s and missile-firing Arrows. Delays in getting the Arrow's missile into production were cumulative: a lengthy evaluation period preceded the selection of the Sparrow 2, and this choice was followed by drawn-out negotiations concerning the licensing agreement for its construction in Canada. Meanwhile, the Royal Canadian Navy has chosen off-the-shelf Sidewinders for its Banshees and has this combination in service now, in addition to almost half its ordered number of CS2F Tracker anti-submarine aircraft, licence-built in Canada with de Havilland as prime contractor.

The latest addition to the anti-submarine forces of Maritime Air Command of the R.C.A.F. is the Canadair CL-28 Argus, the massive ocean patroller and predecessor of the CL-44 Tyne-powered long-range transport, eight of which are on order for Air Transport Command. New this year is the CL-66/Canadair 540 medium-transport project, combining Eland power with Convair 440 airframe to an initial R.C.A.F. order of ten. Canadair's other new baby is a baby jet—the CL-41 jet trainer, being built as a private venture and soon to fly. The R.C.A.F., it is believed, like the looks of this machine, but the priority attached to their jet-trainer requirement is low. Almost, but not quite, as low in priority is the Service's helicopter need.

Outstanding in its record of practical single-engined utility aircraft exported in large numbers to the U.S.A. and over 50 other countries is the de Havilland company at Downsview. The new Caribou, which made its first flight three weeks ago, should prove a worthy, rugged and profitable successor to the hard-working Beaver and Otter.

There is, therefore, no shortage of sound designs, nor of production ability, in Canada's aircraft industry. But this self-sufficient industry has been bought at considerable expense to the taxpayer and, while it is almost certainly worth every dollar and cent, one big question remains before its future can be mapped clearly. Can Canada herself continue to generate a sufficient requirement for aircraft to justify the continuation of the industry at its present size? Canada learned during the last war, as did Australia, that she could not depend on overseas sources of supply in emergency. At the time of the Korean war Canada's volume of aircraft production was outstanding. But the industry is now emphasizing to the Canadian Government that, if a realistic effort is expected of it in any future emergency, an interim tick-over at a low level of activity just is not practicable. The ball is indeed in the government's court.

On a less controversial note, the industry, the R.C.A.F., the Canadian Aeronautical Institute and other interested organizations currently have ambitious plans under way for the celebration next year of the 50th anniversary of the first powered flight in Canada. This was the flight by J. A. D. McCurdy in his Silver Dart at Baddeck, Nova Scotia, on February 23, 1909.

In the following pages the progress of individual companies over the past twelve months is reviewed. The majority of the reports are by a *Flight* staff writer who is a Member of the Canadian Aeronautical Institute and who visited the Dominion last month for the purpose of compiling this review.

FAIREY

flies

the first

vertical

take-off

Airliner

Adding achievement to achievement,
Fairey Aviation have now built—and flown—
potentially the most important transport aeroplane
in the world, the Fairey Rotodyne.
Carrying 48 passengers or 4½ tons
of freight it takes off vertically as a helicopter
and having gained height flies forward
as a normal twin-engined airliner.
It is the most adaptable rotary-wing
aircraft in the world and the first to offer
operating economy directly comparable to that
of fixed wing aircraft over ranges of up to 400 miles.
The arrangement within the Rotodyne's
capacious fuselage can readily be adapted to suit
civil or military applications.
Powered by two Napier Eland
propeller-turbines with Fairey Pressure-Jets at the
rotor-tips for take-off and landing.

48 passengers
185 m.p.h. cruising speed
400 miles maximum range

FAIREY
Rotodyne

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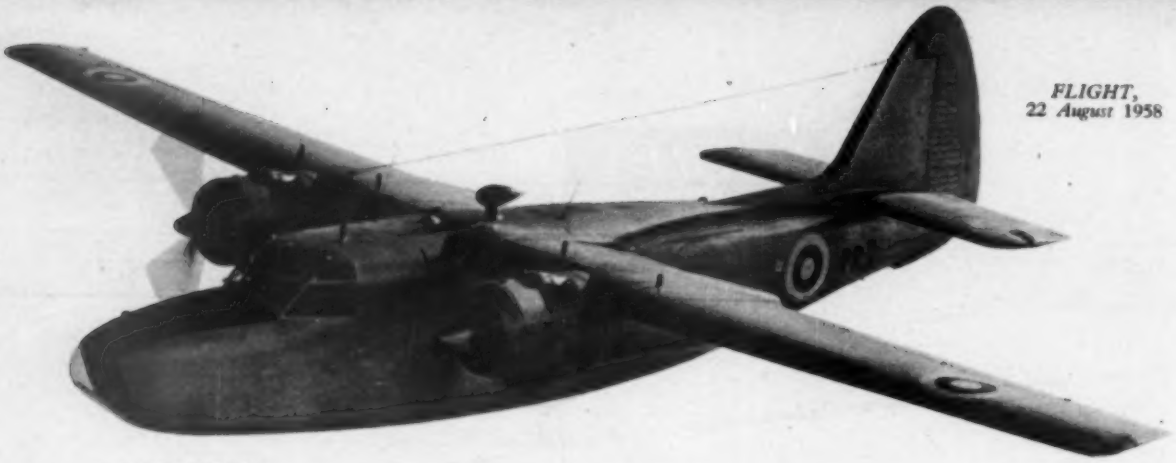


THE VERSATILE

Pembroke

(Powered by Alvis 'Leonides' engines)

Now in service with the Air Forces of seven nations, the PEMBROKE is rugged, dependable and versatile. The PEMBROKE is particularly suitable for the transport of senior staff officers, in which role it is equipped to carry six passengers. The standard communications aircraft carries up to twelve passengers in either forward or rearward facing seats which are quickly removable for conversion to the freighting, photographic, ambulance or supply dropping roles. Pilot training, and aircrew training for which the aircraft is equipped as a flying classroom, complete the varied roles in which the PEMBROKE can be operated. Provision is made for all these roles in the basic structure.

HUNTING AIRCRAFT LIMITED

A Hunting Group Company

LUTON, BEDFORDSHIRE, ENGLAND and at 1450, O'CONNOR DRIVE, TORONTO, CANADA

An Avro CF-100 Mk 5M equipped with dummy Sparrow 2 missiles and re-heat version of the Orenda 11.

The Canadian Industry . . .

A. V. ROE CANADA, LTD.,

170 UNIVERSITY AVENUE, TORONTO

FORMAL recognition of the enormous diversification and industrial expansion programme followed by the A. V. Roe Canada group in recent years has come during the last twelve months with the separation of the member-companies into two major divisions. The aeronautical division of this Canadian Hawker-Siddeley branch comprises Avro Aircraft, Orenda Engines, Canadian Steel Improvement and Canadian Applied Research, while Canadian Car is included in the industrial group. The total number of companies in Canada owned by A. V. Roe Canada is now no fewer than 44, of which 33 were acquired with the taking-over of Dosco (Dominion Steel and Coal) late last year.

Executive vice-president (aeronautical) of A. V. Roe Canada, the holding company, is F. T. Smye, who is also chairman of the boards of the four relevant operating companies (and president of two of them, C.S.I. and C.A.R.L.). A. C. MacDonald is executive vice-president of industrial operations. Chairman of A. V. Roe Canada is Sir Roy Dobson, and Crawford Gordon Jr. is president and general manager.

Avro Aircraft, Ltd., *P.O. Box 4004, Terminal A, Toronto.*

MARCH 25, 1958, was a proud day for Avro Aircraft, and for Canada, as the day on which five years of hard work came to fruition with the first flight of the CF-105 Arrow. This last year has also seen the completion of the Belgian order for 50 CF-100s; and the beginning of Sparrow 2 testing by means of missile-carrying CF-100s. Work has continued on other projects, including the revolutionary Weapons System 606A, for which a top-secret U.S.A.F. research and development contract is held.

Total floor area of the Avro plant at Malton Airport, Toronto, has grown to 1,700,000 sq ft, while employment has remained constant at more than 9,000. During the year J. L. Plant succeeded F. T. Smye as president and general manager.

CF-105 Arrow. Powered by two Pratt and Whitney J75 engines, the first CF-105 Arrow Mk 1 achieved a level-flight speed of over Mach 1.5 at 50,000ft—equivalent to more than 1,000 m.p.h.—during its seventh flight from Malton in April.

Production tooling has been used from the outset in the Arrow programme, and the fifth machine was approaching completion on the line at Malton last month. This will be the last Mk 1 and will be followed by Mk 2 versions powered by the lighter and more powerful Orenda Iroquois engines. The present contract is for a total of 37 aircraft, which are all pre-production machines.

An accident to the prototype Arrow took place during June when pilot Jan Zurakowski was bringing the aircraft in to land after its tenth flight at Malton. The port main landing gear, although fully down, had jammed (unknown to Zurakowski) with the tandem wheels inclined at about 30 deg to the longitudinal axis of the machine, which swerved off the runway at the end of the landing run, causing the landing gear to collapse. The damage to the airframe was not extensive and, although the flight-test rôles of the first and second machines have consequently been exchanged, no significant delay to the overall programme is expected.

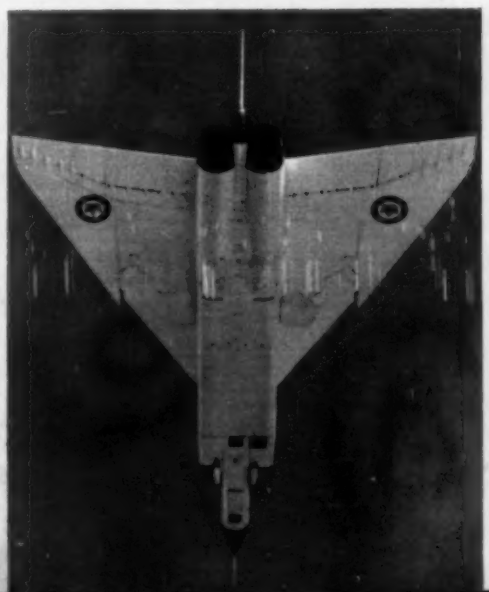
The advanced electronic system for automatic flight, weapon fire-control, communication and navigation of the Arrow is designated Astra and is the responsibility of R.C.A. and Minneapolis-Honeywell, plus their Canadian associates and specialized sub-contractors. Among the many other contributors to the Arrow—some 650 outside suppliers are involved in the programme—are those listed on subsequent pages of this review. The aircraft was fully described in our issue of October 25 last.

The cost of the Arrow development programme was divulged recently in the Canadian House of Commons. The Department of National Defence statement said, "The currently estimated production cost of each complete Arrow aircraft within the 37 pre-production order is $6,100,000. Should the decision be taken to proceed with production, the cost per subsequent aircraft will be reduced considerably.

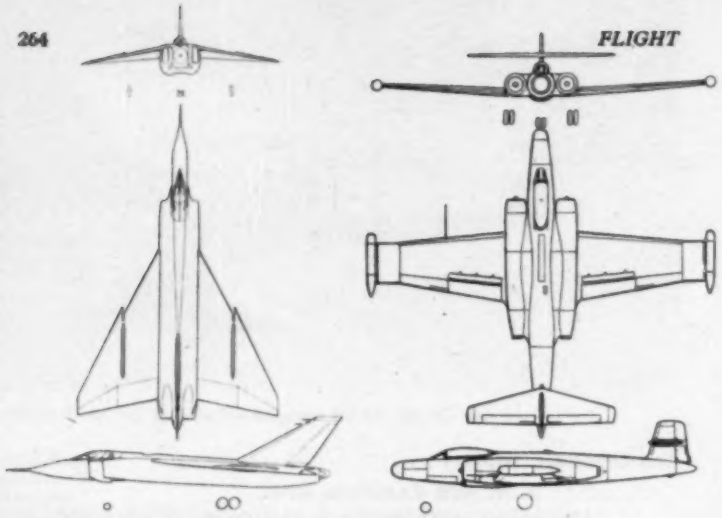
"The total cost to the Government of the complete Arrow aircraft project including design, development, tooling and pre-production costs of the Arrow airframe, the engine programs and the integrated electronic and fire control system, up to May 1, 1958, is $233,000,000. This cost figure also covers two completed aircraft, three in final assembly and 32 others, within the present order of 37 aircraft, in various stages of manufacture and material procurement."

CF-100. Production of CF-100 Mk 5 high-altitude all-weather fighters has continued during the year, but is now only a trickle compared with the peak rates of the Mk 4 era. Delivery of 50 Mk 5s for the Belgian Air Force was completed in less than a year from the contract date.

During the year the Canadian Government cancelled the CF-100 Mk 6 programme covering the missile-carrying version of the aircraft. As part of the development programme for the Arrow



Two contrasting views of the Avro Arrow Mk 1, powered by two Pratt and Whitney J75 engines. Later Mk 2 Arrows will have the more powerful Orenda Iroquois.



CF-105 Arrow 1: Powerplant, 2 P. and W. J75; span, 50ft; length, 77ft 9½in; gross wt, over 65,000 lb; max. speed, over M=2.

CF-100 Mk 5: Powerplant, 2 Orenda 11; span, 54ft; length, 54ft; gross wt, about 37,000 lb; max. speed, about 660 m.p.h.

Iroquois engine is lowered into place in one of the Orenda company's test-cells.

The Canadian Industry . . .

weapons system, however, small numbers of a modified CF-100 Mk 5 known as the Mk 5M have begun test-firing of Sparrow 2 missiles at Point Mugu, California.

Orenda Engines, Ltd., *Box 4015, Terminal A, Toronto.*

WITH the last Orenda delivered and a current programme to provide "an appropriate number" of two-spool Iroquois for the 37 pre-production Arrows on order, it is clearly to the hoped-for Arrow production order in the near future that Orenda Engines are now looking. The first step towards a policy of diversification came during the past year with the formation of a subsidiary company with industrial-engine interests.

The last Orenda engine—an Orenda 11 for the CF-100, and the 3,794th of all models produced—was turned over to the R.C.A.F. on June 18. Orenda production had begun in 1952; volume production was achieved early in 1953; and the 1,000th engine was off the line by February, 1954.

During production, thrust increased to 7,500 lb from an original 5,800 lb; and weight was reduced to 2,400 lb from 2,700 lb despite the addition of a second-stage turbine.

A pre-production batch of Iroquois engines is now going through the Orenda plant, and the first production unit is scheduled for next month. A total of over 5,800 hours' bench running has been logged by development engines to date, and an Iroquois should come together with a Mk 2 Arrow for the first time round about February next. Some 25 hours' flight-running time has been obtained by various Iroquois engines rear-fuselage-mounted on the B-47 test-bed on loan from the U.S.A.F.

The Iroquois has performed well in high-altitude tests during the year, achieving in the NACA Lewis Flight Propulsion Laboratory in Cleveland what are probably the highest dry thrusts for turbojets ever recorded in North America. No difficulty was encountered with the Orenda-patented relight system up to 60,000ft, the altitude limit of the Cleveland tunnel.

Orenda's own high-altitude tunnel, which can test-run advanced engines in an atmosphere equivalent to 100,000ft altitude over a wide range of Mach-number conditions up to M=2.9, is expected to be in operation toward the end of 1958.

A new development was the formation of **Orenda Industrial, Ltd.,** on May 2, 1958, as a wholly owned subsidiary of Orenda Engines to sell and service in Canada the line of diesel engines produced by the Brush Group of Britain.

A programme of technical assistance was arranged in May with Bavarian Motor Works (BMW) of Munich on a "where and when needed" basis. BMW is the company designated by the West German Government to repair and overhaul its Orenda engines.

The entry of Orenda into the small, lightweight turbojet field is made possible by the appearance of the Canadair CL-41 jet trainer. If this aircraft went into production, and if the production versions were powered (as are the two prototypes) by Fairchild J83s, then Orenda might well produce these engines under licence, following-up the existing technical link between the two companies.

Canadian Car Company, Ltd., *(Head Office) 621 Craig Street West, Montreal 3; (Plant) P.O. Box 67, Fort William, Ontario.*

WHILE CanCar's main development at Fort William over the last two years has been the impressive build-up of its commercial road-trailer business, the company's aircraft work continues on the same basis as last year. The two main projects, both under contract to de Havilland Aircraft of Canada, are the construction of the complete centre-section and outer wings for the CS2F Tracker, and the manufacture of wings and tail assemblies for the Otter. The CS2F programme is approximately 65 per cent complete, and should continue until the end of 1959.

A new factor this year has been the company's entry into the field of ground-equipment for aircraft. An R.C.A.F. contract for 30 emergency fuel-pumping trailers has been received, and design work on other types of ground equipment has been carried out.

CanCar has exclusive world sales rights (excluding U.S.A.) for North American Harvards and spares, and the spares section has continued strongly. The plant has reconditioned during the year 25 R.C.A.F. Harvards for export to Europe for NATO use.

Canadian Steel Improvement, Ltd., *41 Horner Avenue, Etobicoke, Ontario.*

CANADIAN Steel Improvement has continued its contribution to the Canadian and American defence picture with the supply of specialized engine and structural forgings in a wide range of alloys in the past year. The company is the only Commonwealth source to be manufacturing on a large scale the stress-free 7079T65 aluminium-alloy forgings used as major structural items on the latest supersonic aircraft.

C.S.I. was very successful in Phase 1 of a U.S.A.F. Air Materiel Command research project on the development of precision structural forgings in titanium alloys. Components were supplied to the primary contractor and have contributed valuable information on this subject. In the production of these specific components, techniques were developed which made possible the manufacture of the forgings to very close tolerances.

A further major contribution has been the manufacture of precision-forged high temperature alloy turbine-blades. Development is continuing on fabrication techniques for the newer high-temperature alloys coming into being in missiles and turbo-jet engines in the form of discs, shrouds and other components.

Canadian Applied Research, Ltd., *1500 O'Connor Drive, Toronto.*

FORMERLY P.S.C. Applied Research, Ltd., this company was acquired by A. V. Roe Canada last year. It designs and manufactures electronic, mechanical and optical instruments and equipment and provides environmental test facilities. At present operating from a 58,000 sq ft plant in East Toronto, the company has planned a new 100,000 sq ft facility for occupation in 1959.

For the Lockheed Electra and the Convair 880 the company is producing specially developed versions of its automatic ice-detection system. Among other current C.A.R.L. products are the R-Theta navigation computer, a recent order for which has been received for Belgian Air Force CF-100s; automatic tri-film processor, now in full production for the U.S.A.F., U.S.N., R.C.A.F. and civilian companies; and Mk 5 airborne profile recorder, also being supplied to the U.S.A. and currently the subject of an M.o.S. evaluation. C.A.R.L. is also a subcontractor on the Sparrow 2 missile programme.

The Canadian Industry . . .

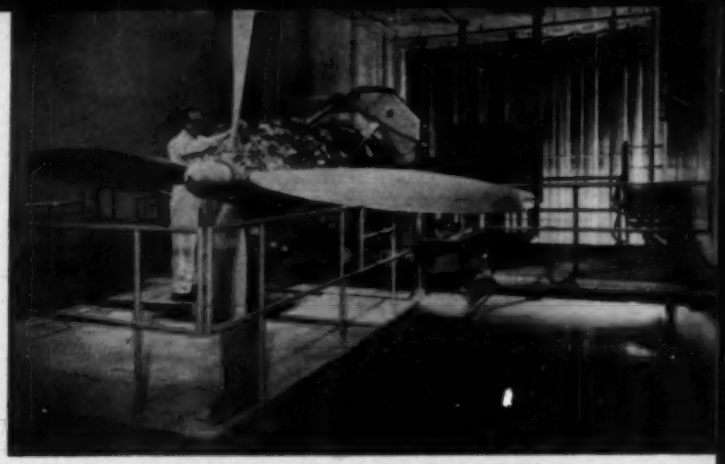
THE BRISTOL AEROPLANE COMPANY OF CANADA, LTD.

200 INTERNATIONAL AVIATION BUILDING, MONTREAL

A NEW development of the Canadian Bristol group of companies was its entry last month into the aircraft handling and servicing business at Dorval Airport, Montreal. This followed the setting-up of an Aviation Services Division of the parent company, Bristol Aeroplane Company of Canada, on July 2 with K. L. Marshall as manager. At present handling C.P.A.L. aircraft in transit through Dorval, the new division hopes to expand its services when the airport's new terminal is opened and, in the more-immediate future, plans to introduce a similar service for airlines at Winnipeg Airport.

Another major development was the increase in activity at the Vancouver Airport plant of **Bristol Aero Engines (Western), Ltd.**, one of the parent company's four operating subsidiaries. This plant has started overhauling Proteus engines from the Britannias of Aeronaves de Mexico: current overhaul life of the engine is 850 hr. Proteus engines of C.P.A.L., also, will be overhauled at the plant, although none has yet reached 850 hours. Other work at Vancouver includes the overhaul of Pratt and Whitney and Wright engines for the R.C.A.F. and commercial operators.

In other respects the Bristol group's activities remain as reported in our Commonwealth issue last year. With the Bristol Aeroplane Company of Canada as parent company, the three remaining subsidiaries are **Bristol Aero Engines, Ltd.** (10210 Pie IX Boulevard, Montreal North 12), overhaul and repair of Wright Turbo-Compound and Merlins for the R.C.A.F. and T.C.A.; **Bristol Aircraft (Western), Ltd.** (Stevenson Field, Winnipeg), formerly MacDonald Brothers Aircraft, largest of the Bristol interests in N. America and the group's only airframe plant, engaged in repair, overhaul and modification of R.C.A.F. aircraft, manufacture of components for the CS2F Tracker, floats, and turbojet components and currently planning to enter the guided-missile field; and **Bristol de Mexico, S.A. de C.V.** (Central Airport, Mexico City), overhaul of piston engines for S. American operators.



Proteus turboprop of Aeronaves in the new test-cell of Bristol Aero Engines (Western) at Vancouver Airport.

CANADAIR, LTD.

P.O. BOX 6087, MONTREAL

THE past year at Canadair has seen solid progress achieved at varying stages on four types of aircraft—including the company's first completely original design, the CL-41 jet trainer—and the phasing-out of two types which have formed a substantial part of Canadair's impressive production record to date. A Division of General Dynamics Corporation of New York, the company employs some 10,500 persons and occupies 3,000,000 sq ft of factory space at Cartierville Airport, Montreal.

CL-28 Argus. Designated the CP-107 by the R.C.A.F., this long-range maritime-patrol aircraft is in full production, with 14 machines completed to date. The handing-over of the first three CL-28s to Maritime Air Command took place on May 17 this year; the Service has since received a further three and the present delivery rate is about one per month.

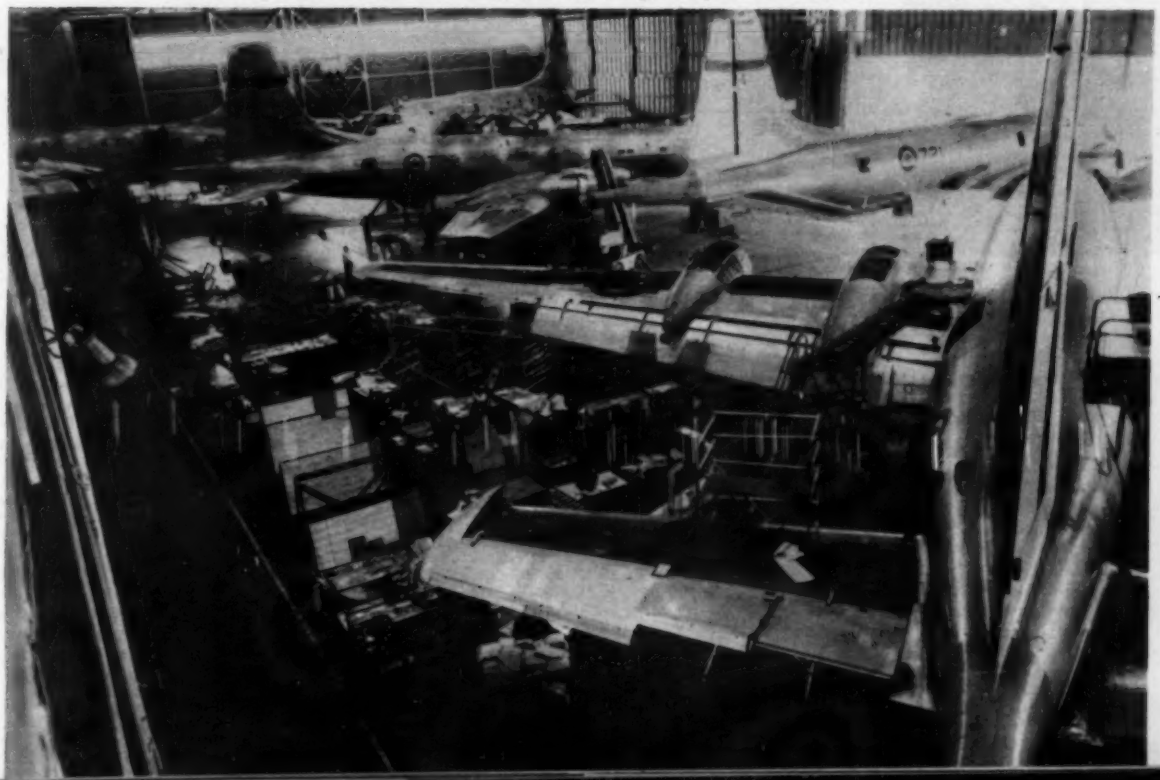
The Argus, which is an unpressurized derivative of the Bristol Britannia powered by four Wright Turbo-Compound engines, was the subject of a full description and cutaway drawing in *Flight* of October 4 last year. Aircraft No. 14 is the first of a new batch featuring new search radar and other more-advanced equipment: an external difference is the smaller chin-mounted radome.

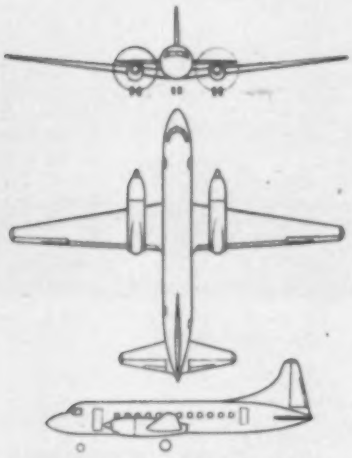
The R.C.A.F. accepted its first Argus on September 30, 1957, after the aircraft had completed 63 hr 40 min of preliminary airworthiness and equipment-functioning test-flying by Canadair. This was followed by a 30-hour preliminary R.C.A.F. assessment of the same features. Proving the structural integrity of the aircraft was completed on the fourth machine, and four phases of flight testing followed.

The first of these, programmed for about 500 flying hours, began at the end of October and is devoted to design refinement and development. The other phases are cold and hot weather trials by the Central Experimental and Proving Establishment of the R.C.A.F. at Namao, Edmonton; evaluation of the weapon system of the Argus by C.E.P.E. at Cold Lake, Alberta (see p. 272); and testing of telecommunications, radar and electronics by C.E.P.E. at Uplands, Ottawa.

Phases still to be completed are performance and handling trials (C.E.P.E.), and intensive flying and operational suitability trials (M.A.C.). The first group of CL-28s delivered to Maritime Air Command were assigned to No. 405 Sqn. at Greenwood, Nova Scotia. These aircraft will replace progressively the squadron's Neptunes, which will in turn be assigned to the M.A.C. station

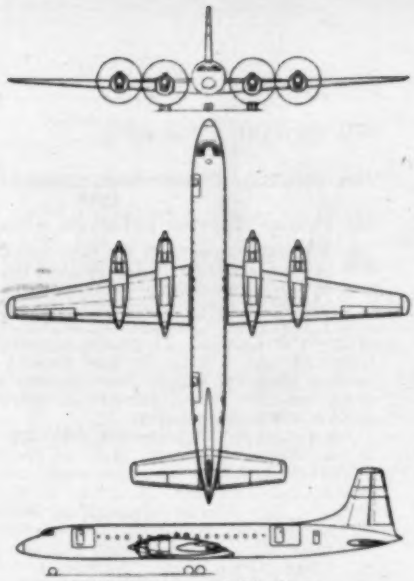
Five of the fourteen CL-28s built to date, seen in the flight hangar at Canadair's Cartierville plant.





CL-66: Powerplant, 2 Napier Eland; span, 105ft 4in; length, 81ft 6in; gross weight, 53,200 lb; cruising speed, 325 m.p.h.

CL-28 Argus: Powerplant, 4 Wright Turbo-Compound; span, 142ft 3½in; length, 128ft 3in; gross weight, 148,000 lb; cruising speed, 230 m.p.h.



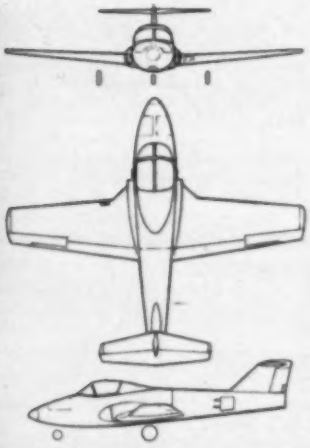
CL-44: Powerplant, 4 Rolls-Royce Tyne; span, 142ft 3½in; length, 136ft 9in; gross weight, 205,000 lb; cruising speed, 360-375 m.p.h.

The Canadian Industry . . .

at Comox, British Columbia, to replace Lancasters.

CL-44. While the Argus is the largest aircraft to be produced in any Commonwealth country outside the United Kingdom, tooling and component manufacture is well advanced at Canadair for an even bigger machine, the CL-44 long-range transport. Designated CC-106 by the R.C.A.F., who have ordered eight, the aircraft was originally planned as a logical Britannia development, to be powered by four Bristol Orions. When development of this engine stopped, Canadair chose the Rolls-Royce Tyne.

Gross weight of the CL-44 is 205,000 lb, compared with 148,000 lb for the Argus. Delivery of the first CL-44 should be made in November next year, and the company hopes to market commercial versions of the type.



CL-41: Powerplant, Fairchild J83; span 36ft 4in; length, 32ft; gross weight, 6,500 lb; max. speed, 445 m.p.h.

Above, new-type radome fitted to the 14th Argus; below, Sparrow 2 air-to-air missile, for which Canadair is co-ordinating contractor.

CL-66. An R.C.A.F. order for ten CL-66 Canadair-built Eland-powered conversions of the Convair 440 was announced in February this year. Since then production tooling for Convair 440 airframes has been transferred from Convair and installed at Canadair (both companies are members of the General Dynamics Corporation), and this medium-range transport should be in full production by mid-1959.

The commercial version of the CL-66 which the company is offering was originally known as the Cosmopolitan, but is now simply the Canadair 540.

CL-41. Canadair's ability to produce—or adapt, redesign and produce—other people's designs has been well demonstrated over the past ten years, and now the CL-41 jet trainer is about to show what the company can do by way of completely original design. Two prototypes, each powered by a Fairchild J83 engine, are approaching completion at Cartierville and should fly before the end of the year.

The company is naturally looking towards the R.C.A.F., who have a requirement for a jet trainer but who have kept very quiet about it in recent years, for an initial production order for the CL-41. Production versions, the company state, can be supplied with either the Fairchild J83, General Electric J85, Pratt and Whitney JT-12 or Armstrong Siddeley Viper, and a version of the Rolls-Royce RB.108 has also been proposed.

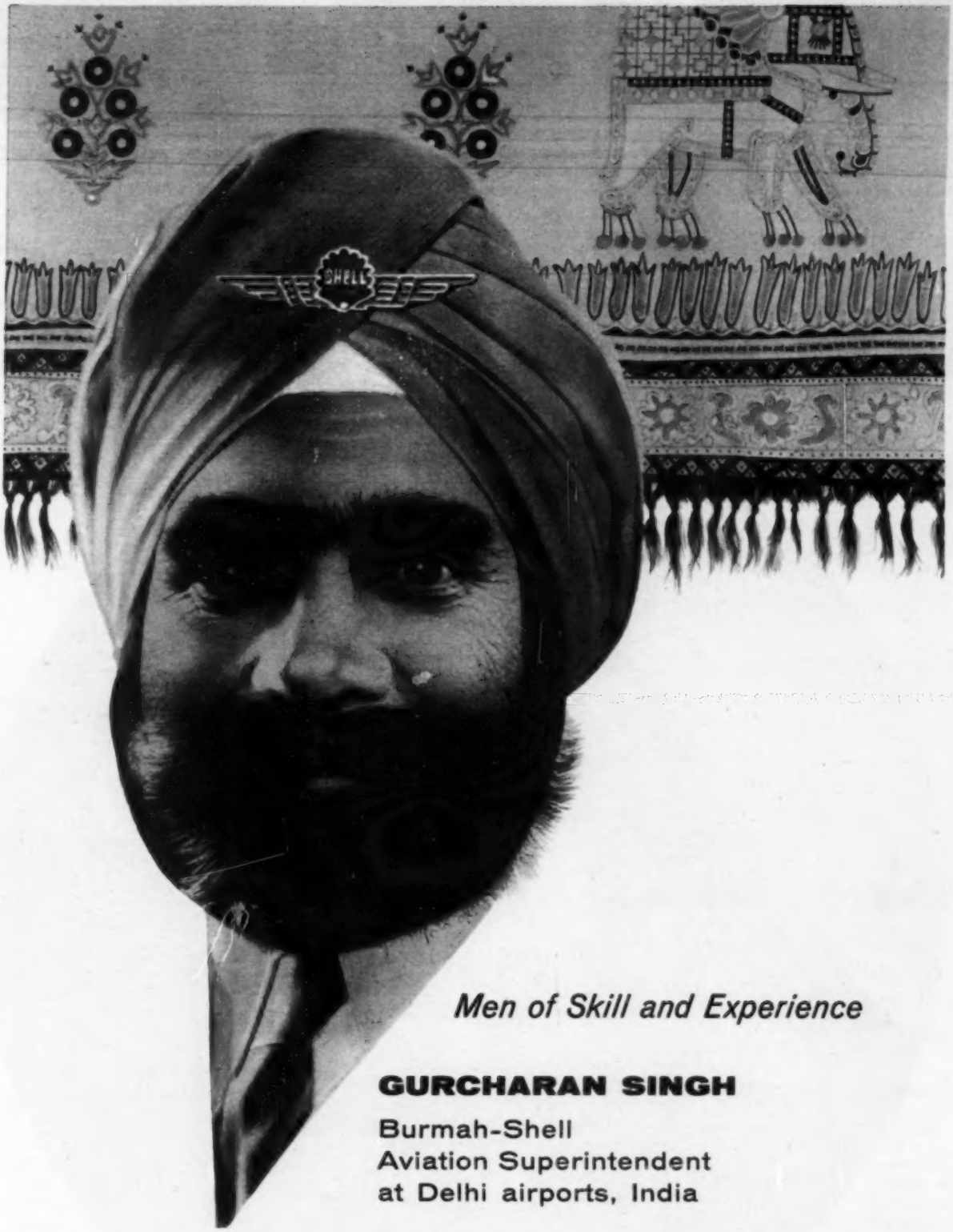
Sabre. Canadair's production of Sabres is finally being phased-out this autumn. The completion of the West German government's order for 225 Sabre 6s brings to a total of over 1,800 the Sabres Mks 1-6 produced in the past nine years.

T-33. With the completion in January next of a current contract for the R.C.A.F., Canadair plans to phase-out the production of its T-33 Nene-powered Silver Star advanced jet trainer. More than 700 have been built, under licence from Lockheed, since 1950.

Sparrow 2. The build-up of Canadair's guided missile organization began in 1951 with a small staff of engineers who provided technical assistance to government establishments in the design and development stages of the Velvet Glove air-to-air missile. After five years this evolved into Canadair acting as the co-ordinating contractor of the final development, test and evaluation of the missile and the test firings at Cold Lake, Alberta.

In April 1957 Canadair was appointed co-ordinating contractor in the Canadian production of the Sparrow 2 air-to-air missile (the manufacturing license of which had been obtained from Douglas Aircraft and Bendix Aviation through the U.S. Government), which had been adopted for the Arrow. The initial production schedule involves the manufacture and test of a number of test vehicles, each batch having a specific purpose and function to perform in the evaluation and test of the missile and the system. These will be followed by the main production run.

The second main contractor with Canadair is Canadian Westinghouse, and among the subcontractor companies are Sperry, Aviation Electric, de Havilland and Computing Devices.



Men of Skill and Experience

GURCHARAN SINGH

Burmah-Shell
Aviation Superintendent
at Delhi airports, India

ONE OF THE MEN RESPONSIBLE FOR SHELL WORLD-WIDE AVIATION SERVICE

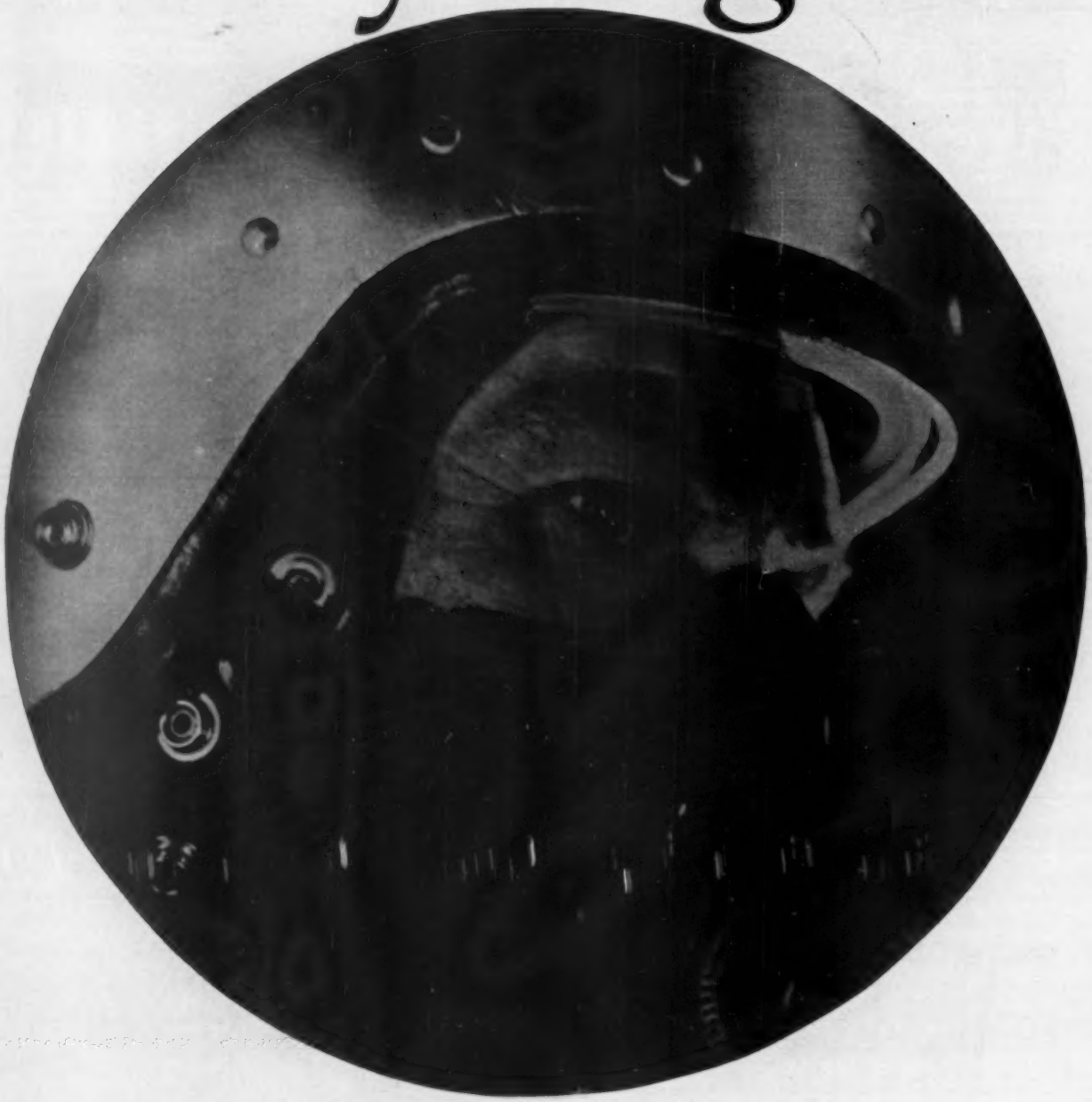
SHELL

V-Bomber Force. Each crew member must have a highly developed sense of responsibility and a high degree of skill and initiative.

Air-to-air missiles. Home defence is a high priority and calls for special flying skills. Never have the fighter pilot's responsibilities been so great.

Transporting troops. A highly responsible job calling for real flying skill and experience in handling some of the R.A.F.'s largest aircraft.

Are you good

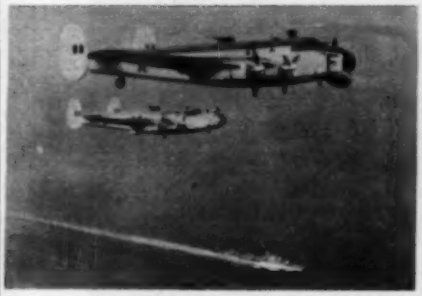


Trans-global flying. To carry out their vital missions, Transport Command aircrews must have the temperament and skill to take the world in their stride.

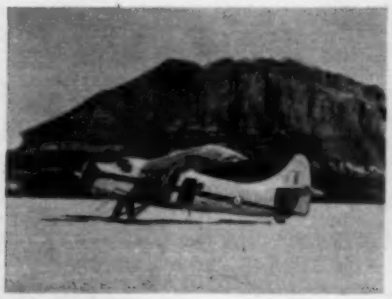
Reconnaissance. To fly with a reconnaissance unit takes judgement, determination, and a lot of experience with high-speed aircraft.

enough?

To fly with the R.A.F. you must be good enough to become a leader in the air, man of science, man of action, and executive, all combined in one...



Guarding the sea approaches. The constant vigilance maintained by Coastal Command aircrews is a real test of alertness and stamina.



Scientific exploration. The recent Trans-Antarctic Expedition exemplifies the many special missions that may come your way in the R.A.F., provided you're good enough.

Overseas operations. Opportunities for adventure overseas. But flying over jungle, mountain, desert or sea can make rather special demands on ability and judgement.

The Royal Air Force *Flying ...and a career*

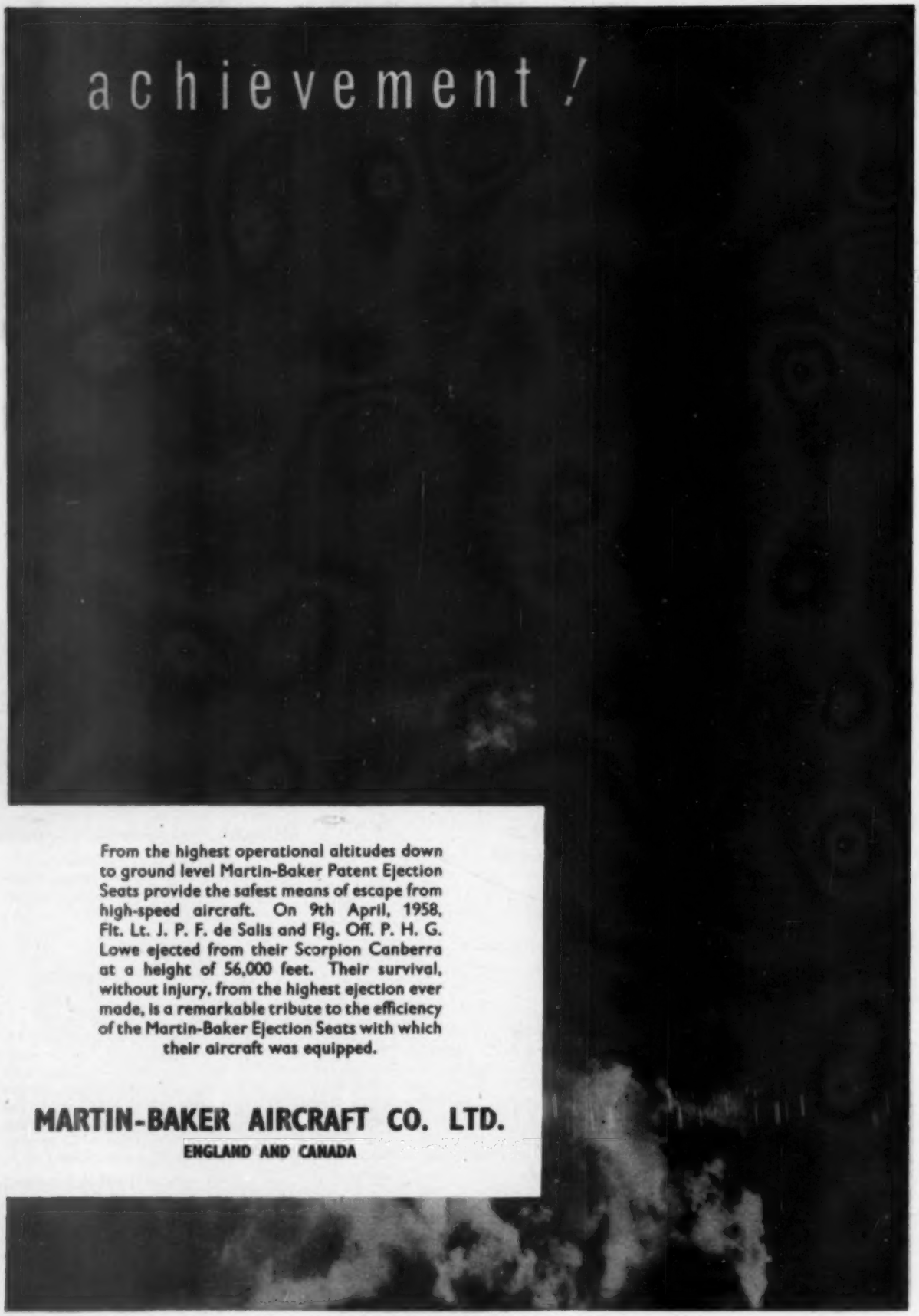
To be selected for aircrew, you must have more than a desire and aptitude for flying, you must, in time, be able to shoulder responsibilities of an officer, to carry out important administrative and technical duties while you lead a life of action.

Growing responsibilities. Throughout your career you take on more and more responsibilities, to the men under you, in administrative, liaison, or training jobs and, perhaps, in high command. You need to develop your scientific and technical knowledge to keep up with the latest technological advances.

Opportunities. You work hard, but you also play hard. You have a chance to travel the world. The money you receive is good by any standards. If you qualify now for a permanent or short service commission and come successfully through your pilot's, navigator's, or air electronics officer's training, opportunities are virtually limitless.

How to join. You can join the R.A.F. through the direct commission scheme which offers the choice of a permanent career leading to a pension or a twelve-year engagement with the option of leaving after eight. If you leave after twelve years you take back to civilian life a tax-free gratuity of £4,000. In addition, there's a five-year short service commission, which may give you the opportunity to gain a permanent commission. Whichever you choose, the pay is good. The new increases in pay and allowances enable a Flight Lieutenant of 25 to earn, with full allowances, nearly £1,700 a year.

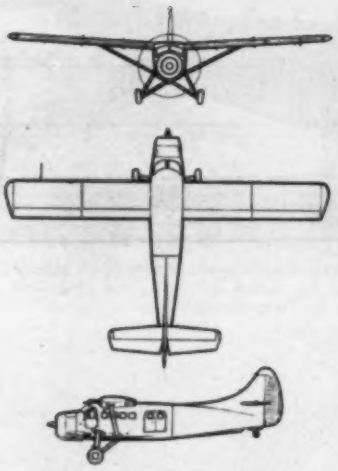
If you are between 17½ and 26, if you have the General Certificate of Education, the Scottish Leaving Certificate, or their equivalent, then write, stating age and education, to the Air Ministry, Department FR23, Adastral House, London, WC1.



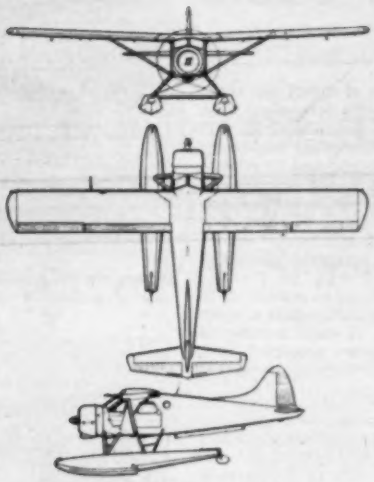
From the highest operational altitudes down to ground level Martin-Baker Patent Ejection Seats provide the safest means of escape from high-speed aircraft. On 9th April, 1958, Flt. Lt. J. P. F. de Salis and Flg. Off. P. H. G. Lowe ejected from their Scorpion Canberra at a height of 56,000 feet. Their survival, without injury, from the highest ejection ever made, is a remarkable tribute to the efficiency of the Martin-Baker Ejection Seats with which their aircraft was equipped.

MARTIN-BAKER AIRCRAFT CO. LTD.

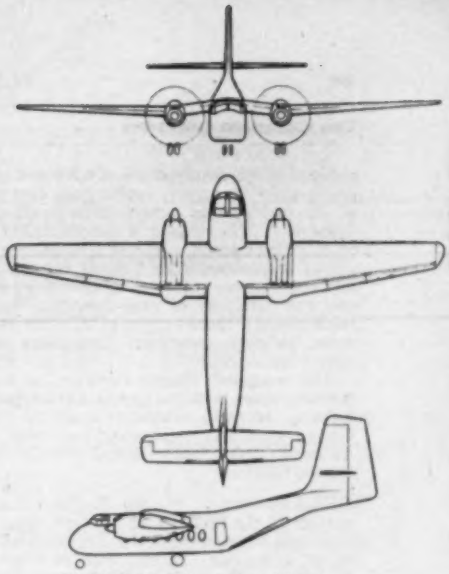
ENGLAND AND CANADA



DHC.3 Otter: Powerplant, P. and W. R-1340; span, 58ft; length, 41ft 10in; gross weight, 7,600 lb; cruising speed, 138 m.p.h.



DHC.2 Beaver: Powerplant, P. and W. R-985; span, 48ft; length, 30ft 4in; gross weight, 4,820 lb; cruising speed (floatplane), 127 m.p.h.



DHC.4 Caribou: Powerplant, 2 P. and W. R-2000; span, 96ft; length, 68ft 10in, gross weight, 24,000 lb; cruising speed, 183 m.p.h.

The Canadian Industry . . .

CANADIAN PRATT AND WHITNEY AIRCRAFT COMPANY, LTD.

LONGEUIL, MONTREAL 23

APPROXIMATELY 70 per cent of the total number of Wright R-1820 engines ordered for the Canadian-built CS2F Tracker have now been delivered by Canadian Pratt and Whitney. Rebuilt R-2000 engines have been supplied to power the D.H.C. Caribou, and two helicopter landing pads are now in operation adjacent to the helicopter overhaul shop at the new plant which the company took over from Sorel Industries last year.

Sole Canadian representative of the United Aircraft Corporation, Canadian P. and W. licence-produces, sells and services products designed by the associated companies of Pratt and Whitney Aircraft, Hamilton Standard and Sikorsky Aircraft. Well-established operations which have continued during the year include spares manufacture and overhaul of Pratt and Whitney R-985, R-1340, R-1830 and R-2000 engines; and manufacture and overhaul of Hamilton Standard propellers and Sikorsky helicopter airframes.

One of the small turbojets available for the Canadair CL-41 jet trainer, the JT-12 produced by the Pratt and Whitney parent company at East Hartford, is the result of initial design work carried out by the Canadian company's development engineering section at the Jacques Cartier main plant near Longeuil. Known originally as the JTC-12, this engine was initially intended for manufacture in Canada after detail design work by the parent company but in the event the whole project, after the Canadian company's initial design, was taken over by Hartford.

Among other work carried out by Canadian Pratt and Whitney's development engineers have been a number of design studies and theoretical analyses of various VTOL arrangements for the Defence Research Board of Canada.

To fit the current CS2F programme the company has reduced to half the previous monthly output of R-1820s, and the total number ordered has been reduced. The number of employees has decreased from 3,000 one year ago to about 2,000 at present. The overhaul and supply side of the company has just about maintained last year's volume of business, with a change in emphasis away from piston engines towards helicopters and accessories.

Helicopter overhaul shop at Canadian Pratt and Whitney, Longeuil.

THE DE HAVILLAND AIRCRAFT OF CANADA, LTD.

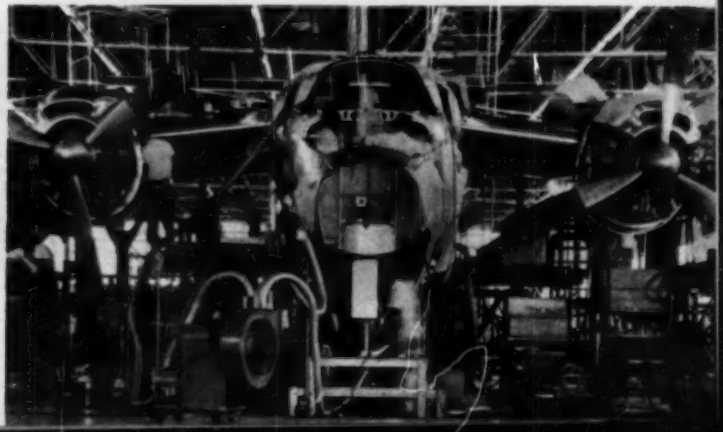
DOWNSVIEW, ONTARIO

MAJOR event during de Havilland's year has undoubtedly been the first flight, on July 30, of the DHC.4 Caribou medium-sized STOL utility aircraft. In the background to this achievement at Downsview has been the continued production of the ubiquitous Beavers and Otters, and of licence-built CS2F Trackers for the R.C.N.; and an active guided-missile department whose products include components for the Sparrow 2.

Re-arrangement of the factory premises to accommodate Caribou production at Plant 1 has involved the movement of all Beaver and Otter work except final assembly from there to Plant 3, the engine facility. The CS2F production line, the guided-missile division and the engine division are all located in Plant 2, adjacent to Plant 3 on the north side of the airfield. A 50,000 sq ft third-floor extension to Plant 1 now houses part of the engineering, accounts, production control and publications departments, and the total floorspace at the beginning of this year was 882,400 sq ft.

The company's Guided Missiles Division, which works closely with de Havilland Propellers in the U.K., has been actively

Above, a CS2F-1 Tracker, licence-built in Canada by de Havilland and a large number of sub-contractors. Below, a view of the prototype DHC.4 Caribou as it approached completion at Downsview.



engaged in the development of advanced types of rotary and static power-units for missile applications over the past few years. One of the turbine-type power units is now in production for the Sparrow 2. The division's manufacturing facilities are backed up by full development and test laboratories. In addition to power-supply requirements for Canada and the U.S.A., the division has concentrated on infra-red development for missile applications and the detection of near-terrestrial bodies and, to meet new requirements, special types of airborne electro-mechanical equipment, airborne computers, transistors and magnetic amplifiers have been designed.

The company's Engine Division has continued to operate as in previous years, with the overhaul and repair of 310 Orenda engines forming the main volume of work last year. A small number of Ghosts were also overhauled, and other engines processed have included Gipsy Queen 70s and 30s and the power-egg assemblies for the CS2F.

DHC.2 Beaver April 26 of this year marked the tenth anniversary of the first Beaver delivery, since when the total number produced has risen to over 1,250. By December 31 last there were 1,169 in service. At the time of *Flight's* visit to Downsview last month, Beaver No. 1,260 was approaching completion for the Royal Canadian Mounted Police. On many types of landing gear—floats, skis and amphibian—Beavers were operating in no fewer than 58 countries by the end of last year.

DHC.3 Otter A larger development of the rugged Beaver, the Otter has been in production since 1951 and almost 300 have been completed to date. Military orders have accounted for about 70 per cent of these. The 126th Otter off the production line made a historic polar flight of 1,450 miles nonstop across Antarctica early in January: among recent new customers for the type have been the air forces of India, Chile and Indonesia.

A modified Otter has recently been the subject of advanced aerodynamic STOL research by D.H.C. engineers for the Defence Research Board. Statically mounted on a large tubular framework, this aircraft may be followed by a second experimental STOL Otter which will carry out flight tests.

DHC.4 Caribou The largest original product of de Havilland Canada, the Caribou is a twin-engined utility aircraft designed to carry a 3½-ton payload and to take-off and land on short, improvised airstrips. Powered by two Pratt and Whitney R-2000 engines, it incorporates full-span double flaps, and rear-loading doors (which may be opened in flight for parachute drops or quick ground disembarkation of troops). As a civil transport, it is designed to carry 27 passengers and baggage.

The first Caribou flew for the first time only three weeks ago, on July 30, and the second machine is due to fly in mid-September. A further 15 aircraft, to be produced next year, will complete the initial batch. Five of the 1959 machines have been ordered for evaluation by the U.S. Army; one of the two prototypes will be used for certification trials and engineering development, and the other prototype will be evaluated for the Canadian Army.

The performance of a turboprop version of the Caribou has been analysed by the company, and a preliminary model specification has been written describing this aircraft. The present Caribou has evolved from a "Twin Otter" project which formed the subject of a company design study in 1954. This would have been a 15,000 lb machine (gross weight of the Caribou is 24,000 lb) powered by R-1340 engines.

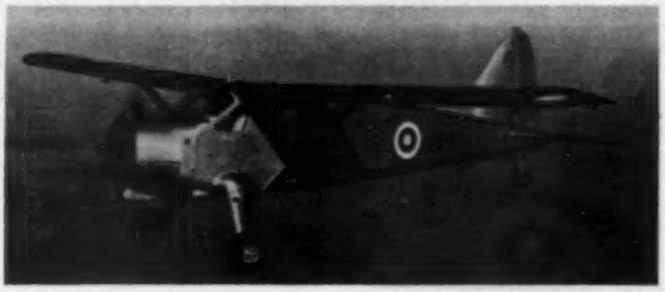
The high-lift devices on the Caribou are quite complex, although based on an extension of Otter techniques. The final configuration will depend on the initial flight tests, but it is known that lowering or raising the double slotted flaps will automatically alter the tailplane incidence, in order to reduce the trim-change. Another feature is that the travel of the two-piece ailerons, also, is related to flap position, giving maximum aileron effect for low-speed control when flaps are down. Drooping leading-edge flaps are fitted, and the outboard sections of the ailerons also droop.

Estimated performance figures for the Caribou at 24,000 lb include take-off ground-run of 490ft (short field technique) and 885ft (airline technique); distance to clear 50ft obstacle, 840ft and 1,305ft respectively; landing ground-run, 425ft and 565ft; landing distance from 50ft obstacle, 1,000ft and 1,305ft; and climb gradient after take-off (landing gear up) 20 per cent (both engines) and 4.3 per cent (one engine).

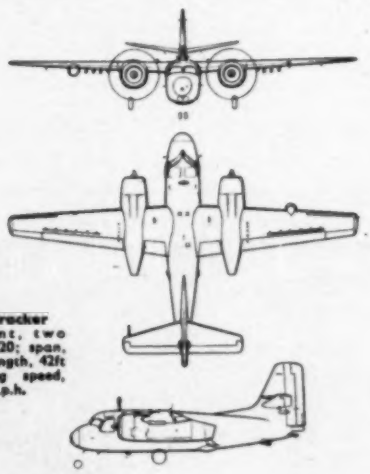
With a maximum range of 1,350 miles, the Caribou (freighter version) is designed to carry a 7,180 lb payload over 200 miles, 6,385 lb over 400 miles, 5,590 lb over 600 miles and 4,795 lb over 800 miles, assuming a 7,500ft cruise at 2×750 b.h.p. and a 45 min fuel reserve. The wide c.g. range of the aircraft is designed to allow an unusual variety of cargo loading arrangements.

CS2F-1 Tracker The production of the Canadian version of the Grumman S2F anti-submarine aircraft for the R.C.N. is extensively subcontracted throughout the industry, with de Havilland as prime contractor responsible for front fuselage manufacture, assembly of complete aircraft and installation of equipment. Some 55 Trackers had been completed by the end of last month, of which over 40 had been delivered. The remainder were being fitted with improved internal equipment at Downsview, a retroactive modification for all Trackers. Normal delivery rate is two per month, and completion of the contract is planned for 1959.

Among aircraft exported by de Havilland Canada last year were (above) one of a fleet of Otters for the Indian Air Force, and (below) a Finnish Air Force Beaver.

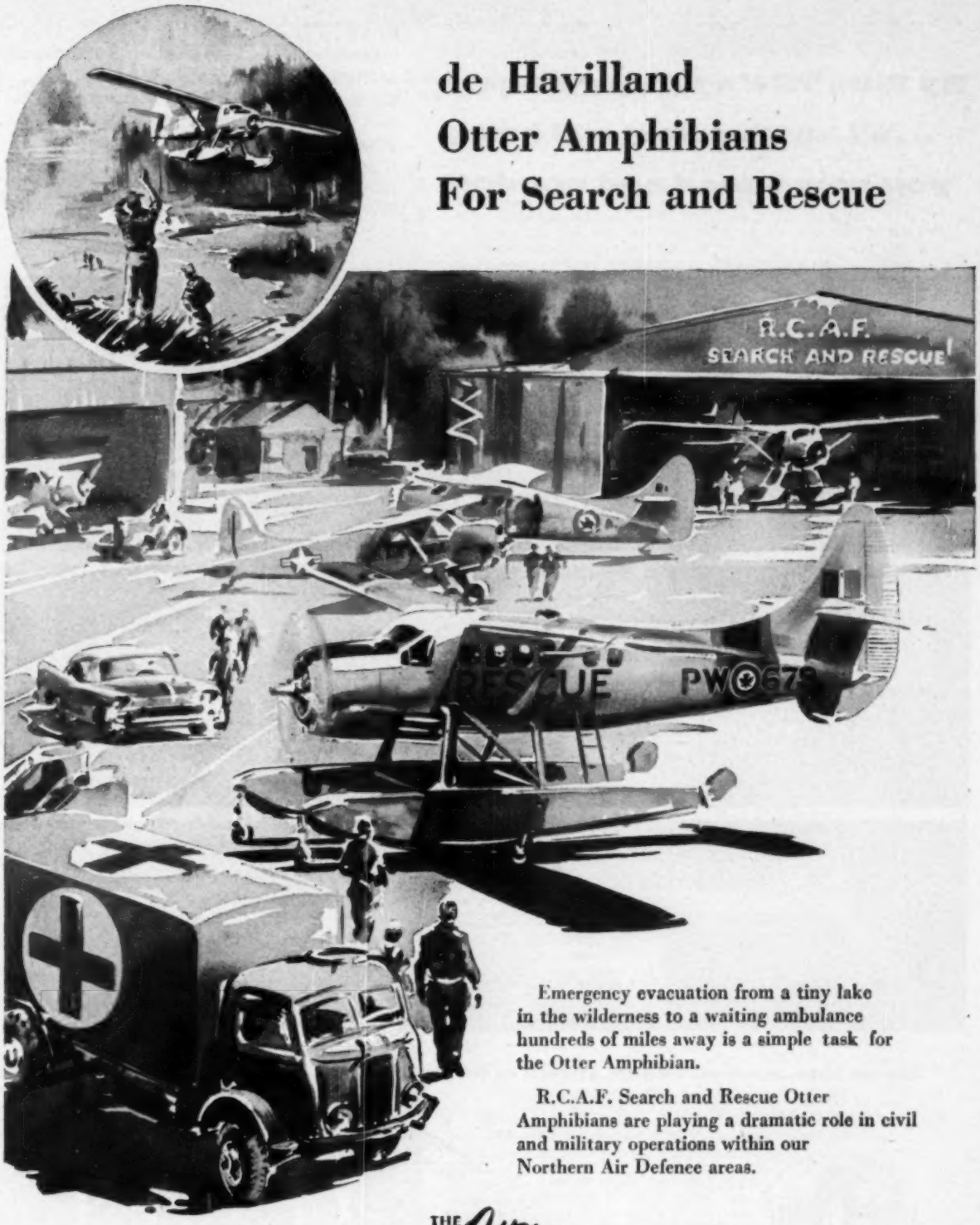


Below, a CS2F Tracker displays its wing-folding ability.



CS2F-1 Tracker
Powerplant, two Wright R-1820; span, 69ft 8in; length, 42ft 3in; cruising speed, 150 m.p.h.

de Havilland Otter Amphibians For Search and Rescue



Emergency evacuation from a tiny lake in the wilderness to a waiting ambulance hundreds of miles away is a simple task for the Otter Amphibian.

R.C.A.F. Search and Rescue Otter Amphibians are playing a dramatic role in civil and military operations within our Northern Air Defence areas.

THE *Otter*

58-7

Designed and built by

THE DE HAVILLAND AIRCRAFT OF CANADA LIMITED

DOWNSVIEW, ONTARIO CANADA

Western Sales and Service: Municipal Airport, Edmonton, Alta.

Pacific Coast Sales and Service: Vancouver, B.C.

E

By 1961, TCA's all four-engine ...all-turbine fleet will bring you new speed and comfort

By 1961, TCA, one of the world's great airlines, will become the first intercontinental airline in the world to operate an all-turbine fleet. The remodelling of the TCA fleet has already begun, for in 1955 TCA introduced the now famous Viscount into North America. In 1956 giant Douglas DC-8 jetliners were ordered, and in 1957 20 Vickers Vanguards, powered by Rolls-Royce Tyne prop-jet engines.

Three fine aircraft—each ahead in its field

The Viscount and Vanguard will operate over short and medium ranges; the turbo-jet DC-8, with its higher speed, on TCA's long-distance routes.

TRANS-CANADA AIR LINES

ONE OF THE WORLD'S GREAT AIR LINES

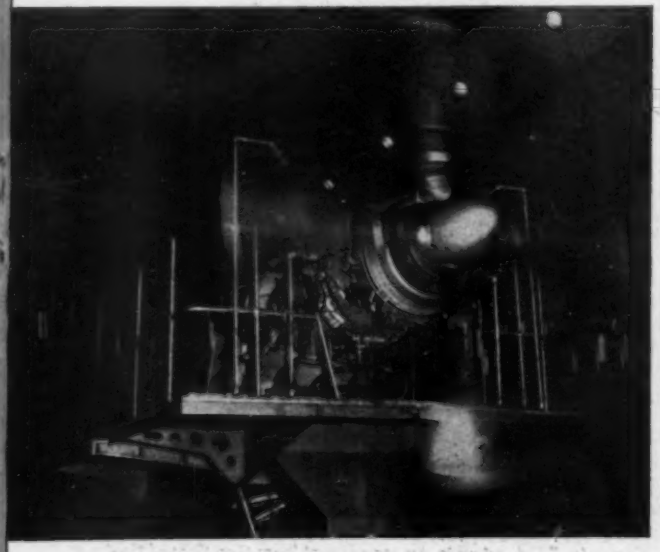
Serving Europe, all Canada, the U.S.A., Bermuda, Nassau and the Caribbean

The branch plant of the Fairey Aviation Company of Canada at Patricia Bay Airport on Vancouver Island. Among recent work was Avenger crop-dusting conversions. The company's main plant is at Eastern Passage, Nova Scotia.

The Canadian Industry . . .

Headquarters and factory of Rolls-Royce of Canada, located near Dorval Airport on Côte de Liesse Road, Montreal. On the right of the main plant is the newly-opened turboprop test-cell, illustrated below, and at the rear is the recent plant extension. The land between the factory is company-owned and available for further expansion.

A Dart engine from a Cubana Airlines Viscount mounted in Rolls-Royce's new turboprop test-cell. This cell, the company's third, is designed to accommodate engines up to 7,000 s.h.p.



THE FAIREY AVIATION COMPANY OF CANADA, LTD.

P.O. BOX 69, DARTMOUTH, NOVA SCOTIA.

COMPANY operations during the past twelve months have, as in previous years, been mainly concerned with the repair, modification and overhaul of R.C.A.F. and R.C.N. aircraft.

Dealing first with R.C.A.F. aircraft types, the conversion of the Lancaster Mk 10S to Mk 10DC (Ryan Firebee drone-carrying rôle) was completed satisfactorily. Modification and overhaul programmes on the P2V-7 Neptune progressed, although at a reduced intensity. Following the introduction of the Canadair Argus into service with Maritime Air Command, it is expected that this aircraft will be making its appearance in the not-too-distant future for overhaul and servicing.

Aircraft work for the R.C.N. continues, with the emphasis on the twin-jet McDonnell F2H-3 Banshee fighter (including modification of this machine to take Sidewinder air-to-air missiles) and the Canadian-built CS2F Tracker anti-submarine aircraft. The Avenger A/S aircraft has now been taken out of R.C.N. service but Fairey recently converted a number of Avengers to commercial crop-dusting rôles. This work was carried out both at the main plant at Eastern Passage, Nova Scotia, and at the company's branch plant at Patricia Bay, British Columbia.

Production of the Fairey Hydrobooster and Fairey hydraulic and pneumatic actuators continues within the company's hydraulics division. The Fairey Microfilter is also being produced by the hydraulics division and, to assist in the overhaul of this unit, an ultrasonic cleaning facility has recently been installed.

To control the marketing and servicing of a variety of products in which the company is becoming increasingly interested, a sales division was recently formed.

A short time ago, the company was appointed the Atlantic Provinces agent for R.F.D. marine inflatable survival equipment. Customers in the Maritime Provinces are now offered a complete sales and service organization for the installation, inspection and repair of R.F.D. inflatable life rafts. This facility bears D.O.T. approval.

At Patricia Bay Airport on Vancouver Island the company's branch plant continues to survey, overhaul, repair and modify a range of both civil and military types of aircraft.

ROLLS-ROYCE OF CANADA, LTD.

P.O. BOX 1400, STATION O, MONTREAL 9.

THIS year has seen the inauguration of Dart overhauls at the company's main plant at Montreal, and an expansion of facilities to include an extra 27,000 sq ft of floorspace and a third engine test-cell, designed expressly for turboprops. Steps are already being taken to provide after-sales service for the Tynes which will be fitted to T.C.A.'s Vanguards and the R.C.A.F. CL-44s, and the Conways of T.C.A.'s DC-8s.

While the major airlines operating Viscounts in North America normally carry out their own Dart overhauls (after their engineers have attended the Rolls-Royce instruction school at the plant), the Dart overhaul line at Montreal has been established to handle the engines of the many smaller operators. The first company-overhauled Dart was delivered to Cubana Airlines in April, and an initial overhaul rate of about 100 per year, for 8-12 operators, is envisaged.

The expansion of the factory has involved a reorganization of facilities (which was well under way when *Flight* visited the company last month) in order to separate the manufacturing and overhaul/repair operations, and to increase the spare-parts stores area to maintain the established 30-day delivery service. Spares manufacture and overhaul of Nenes (R.C.A.F. T-33s), and overhaul of Westinghouse J34s (R.C.N. Banshees) is continuing.

For the immediate future, an increase in Dart overhaul work is anticipated for the North American operators of Fairchild-built Friendships, and of Grumman Gulfstreams. An agreement is being concluded with Pacific Airmotive of Burbank for the U.S. company to begin Dart overhauls next year; and the subsequent provision of an overhaul base at Sao Paulo, Brazil, is also being considered. The establishment of a spares and service depot near Washington, D.C., by the subsidiary company Rolls-Royce, Inc. —originally planned for this year—has been postponed because of the expansion programme at Montreal.

As mentioned in our account of Canadair activities, a version of the Rolls-Royce RB.108 has been put forward as a powerplant for the CL-41 jet trainer. The total number of persons employed on aero-engine work [there is also a car division and an industrial (diesel) engine division] at Rolls-Royce of Canada is about 700.

Seen at Vancouver is a C.P.A.L. Britannia 314, first-line equipment of the carrier which hopes to be granted transcontinental domestic traffic rights in competition with T.C.A. Beyond is a T.C.A. North Star.
"Flight" photograph

Airline Competition in Canada

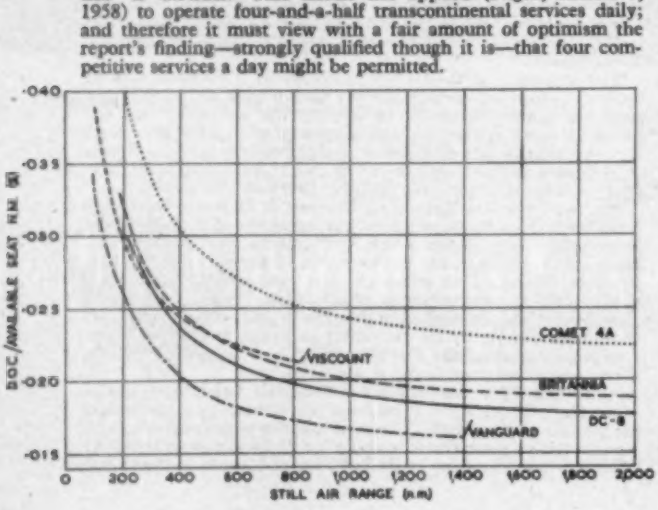
A COMMENTARY ON THE WHEATCROFT REPORT

LATER this summer the Canadian Air Transport Board are to hold a public hearing on Canadian Pacific Airlines' and Pacific Western Airlines' applications to operate transcontinental domestic services. These routes have hitherto been the monopoly of Trans-Canada Air Lines. The Canadian Government is in principle predisposed to "some measure of competition"; however, it called for an independent review of the desirability and economic consequences of such competition. This was undertaken by Mr. S. F. Wheatcroft, who is economic adviser to B.E.A. and author of *The Economics of European Air Transport*.

His report is worth close study outside as well as inside Canada because it sets out certain basic principles which are applicable to air transport in general. It also puts into better perspective the possible new market for transport aircraft which the granting of transcontinental domestic routes to C.P.A.L. or P.W.A. might open up.

Simply stated, the conclusion of the 79-page report is that if competition were permitted immediately it would lead to a T.C.A. deficit *unless* such competition were strictly limited in its extent. The "absolute maximum possible" competition which could be permitted in 1959 without leading to a T.C.A. deficit would, says the report, be approximately four daily transcontinental services; however, these might be reduced to two services daily to ease T.C.A.'s problems of adjustment (for example, the disposal of aircraft on order), and to allow them a share of traffic growth (without which their unit costs would probably increase). For the future, the study considers that the prospects for competition *without* danger of cost increases appear to improve considerably at some date in the years between 1961 and 1966.

The favourite candidate for the introduction competitive transcontinental services—though of course the report does not suggest this—is C.P.A.L. This airline has applied (*Flight*, March 7, 1958) to operate four-and-a-half transcontinental services daily; and therefore it must view with a fair amount of optimism the report's finding—strongly qualified though it is—that four competitive services a day might be permitted.



Mr. McConachie decide to use Britannias for transcontinental use, a repeat-order for about four of these aircraft might be placed. But it seems possible that the *net* result of a successful C.P.A.L. application would be "no gain" for the British industry as a whole, since T.C.A. might have to back down on part of their order for 20 Vanguards.

The acquisition by C.P.A.L. of two types of jet (i.e., three types of turbine airliner) appears unlikely; more likely is the possibility that Britannias might be used for domestic operations. This possibility is reinforced by an important section of the Wheatcroft report devoted to the general problems of equipment and technological progress. Though written in a Canadian context, these words have a meaning for the air transport industry as a whole:—

"There is the question whether very rapid technological progress is invariably in the best public interest. This is a problem of very great importance in the world airline industry at the present time. It may well prove that the present rate of technological progress, which threatens to make obsolete nearly all existing aircraft in the next three or four years, is more than the industry can afford.

"The industry faces a crisis as a result of the jet revolution. The speed of the new jet aircraft is such an important competitive factor that, if there is no difference in the fare levels, the airlines will increasingly be forced by competition into using these aircraft even on routes where other types of aircraft could provide lower cost service."

Mr. Wheatcroft considers that in the Canadian domestic market

"This kind of development could well mean that airline competition resulted in a higher level of costs and hence higher fare levels. The danger can be demonstrated by a consideration of the operating costs of the aircraft which might be used on competitive services within Canada. [The graph] shows the operating costs at various ranges for the Viscount, Britannia, Comet, DC-8 and Vanguard.

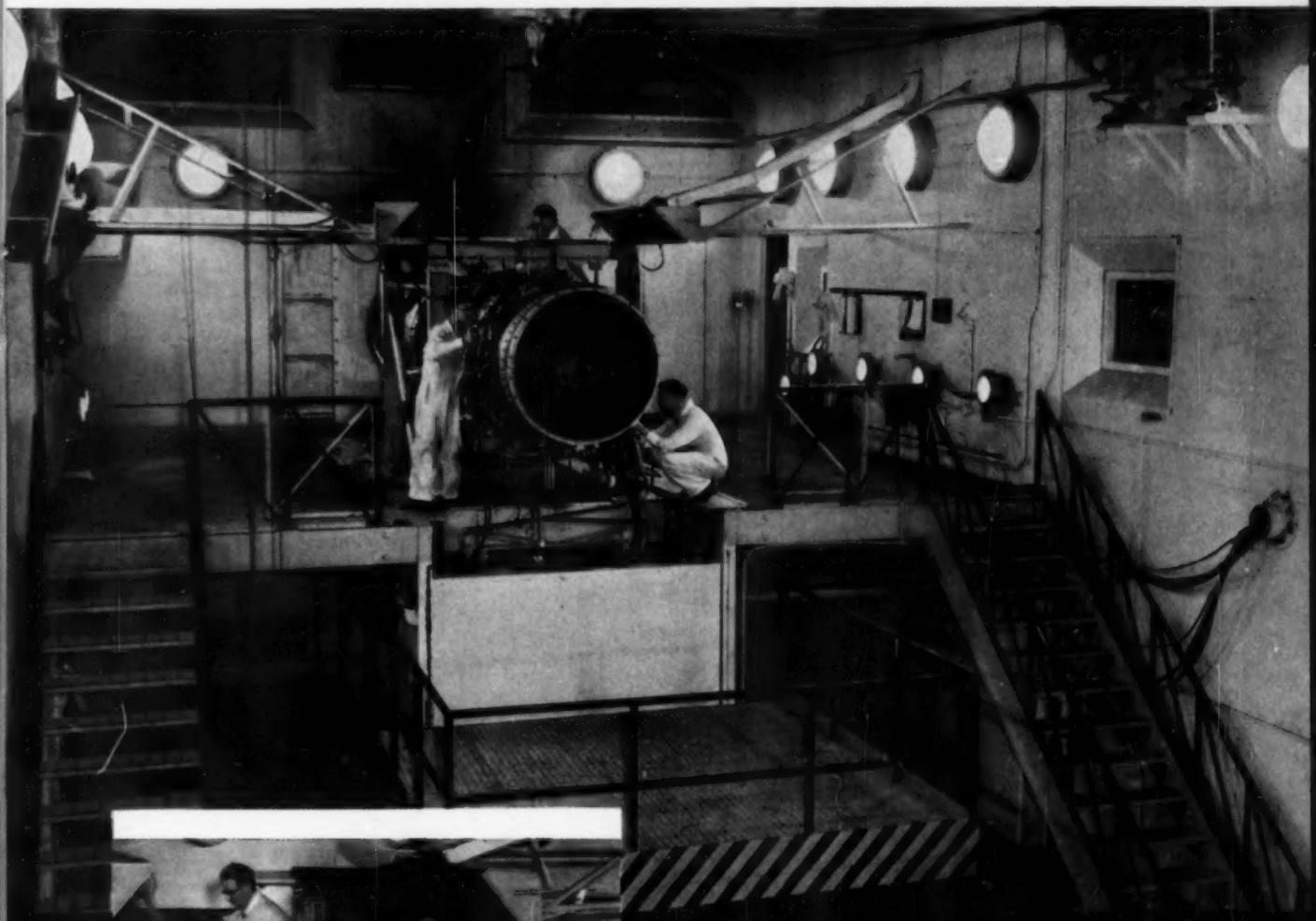
"T.C.A.'s future plans are based upon using the DC-8 only on a limited number of long haul domestic routes on which the seat-mile costs of this aircraft come closest to those of the Vanguard and on which a significant time saving is offered.

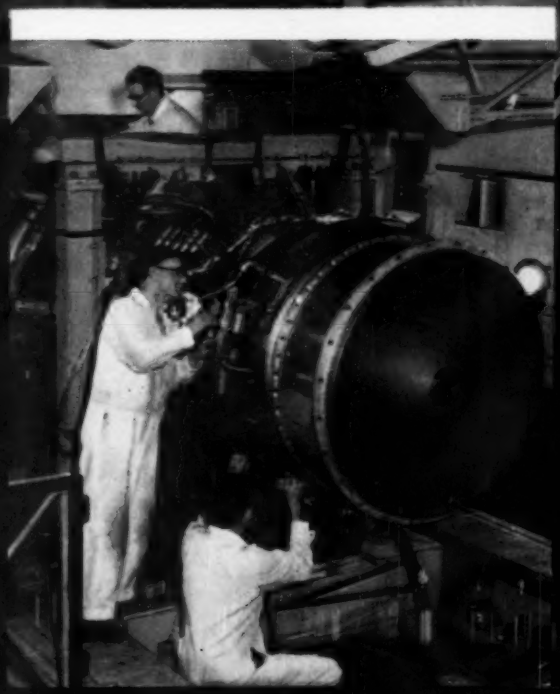
"If, however, competitive service were authorized on the transcontinental routes it is highly probable that the new airline might introduce jet service on those routes on which T.C.A. now plans to operate the Vanguard. Jet service on such routes, either with the Comet or the DC-8, would involve a significantly higher level of cost than the Vanguard but it might appear worth while because of the competitive advantage it would give to the carrier introducing it. The inevitable result would be, however, that T.C.A. would be obliged to meet the jet competition and replace Vanguard services by jet services. The result of this would be that the overall level of operating costs would be increased and higher fares would be necessary.

"This danger can only be avoided if the regulatory agency insists that fares should be based on operating costs. If a competitive carrier introduces jet services on routes on which they involve a higher level of operating costs they should be obliged to charge a premium fare for the jet services. A policy decision of this nature, extended also into the international field, might go a long way to overcome the crisis which the whole industry may face in the next few years."

Only rarely is it possible to publish an airline's own comparison of aircraft costs. In reproducing this T.C.A. analysis from "Airline Competition in Canada," we would add that costs may vary widely depending upon an airline's particular circumstances. Assumptions here are I.S.A.; constant-altitude cruise; seating capacities: DC-8, 126; Vanguard, 101; Britannia, 101; Comet 4A, 74; Viscount, 44. Costs of the Comet 4B, T.C.A. estimate, are ten per cent lower than those of the 4A.

Rehearsal for Mach 3 at 100,000 feet





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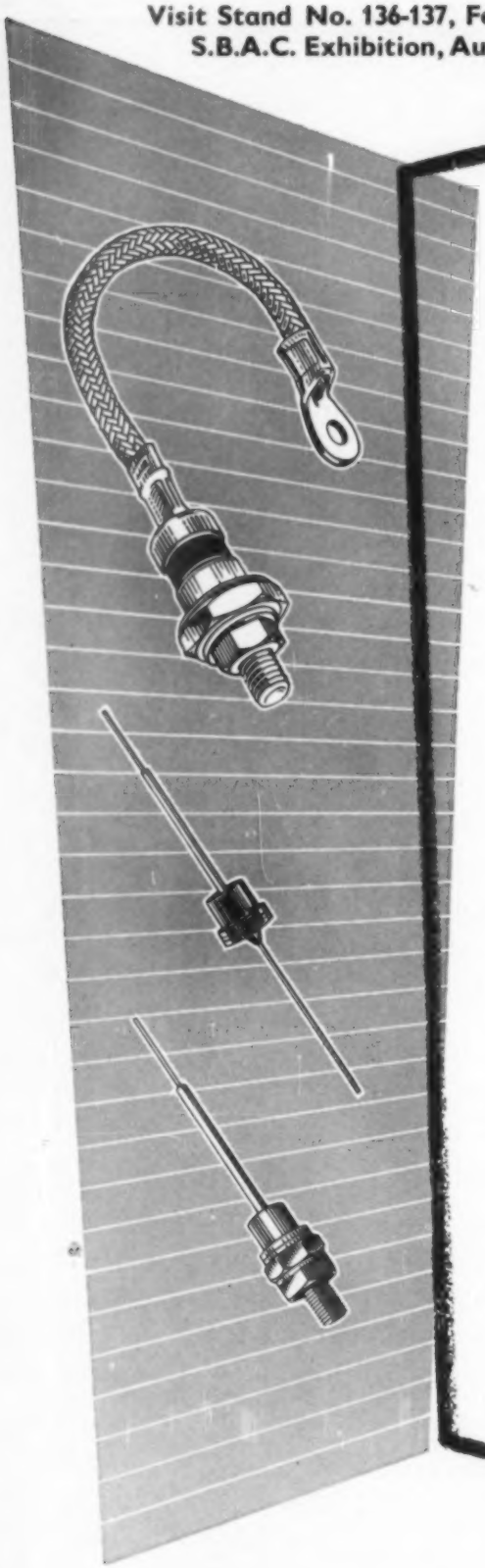

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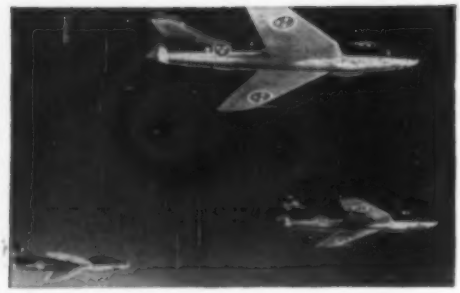
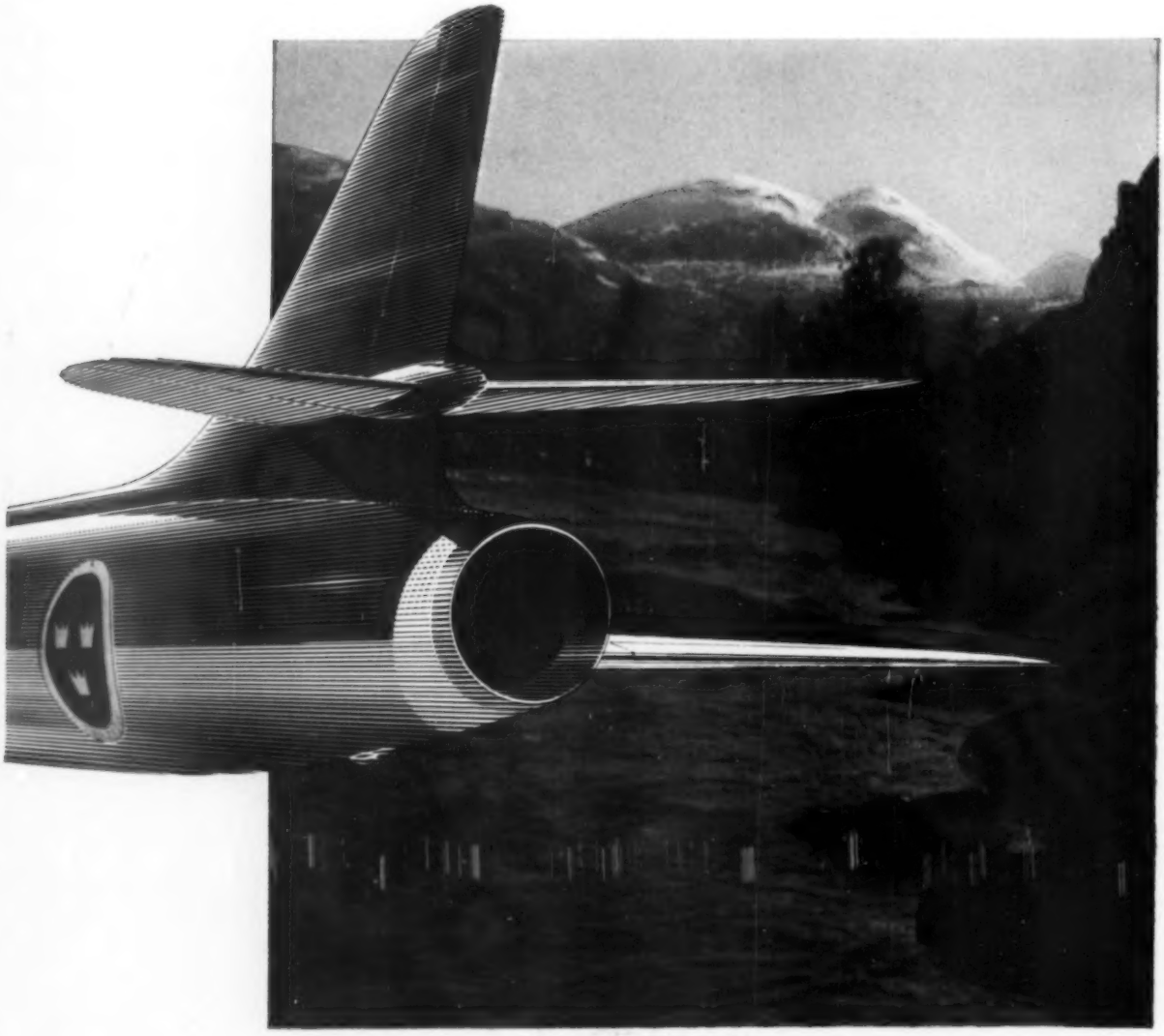


Hunters Defend SWEDEN

Speed, offensive power and great versatility have given the Hawker Hunter pride of place in many air forces of the free world, including that of Sweden. Today several squadrons of Hunters are in service with the Swedish air force, forging another sturdy link in the defences of Western Europe.
Hunters are also in service in India, Denmark, Holland, Belgium, Peru, Iraq — and now Switzerland.



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Airline Competition in Canada . . .

These are strong words, and they are valid only if T.C.A.'s comparative cost analysis is valid. In a recent issue of *Canadian Business*, Mr. McConachie of C.P.A.L. estimated the Britannia's direct cost at 2c/seat-mile over stages of between 400 miles and 4,000 miles—i.e., roughly the same as T.C.A.'s estimate. But if these costs *are* a fair indication of the capabilities of these aircraft it would be difficult to challenge the Wheatcroft doctrine, except in one respect. The charging of a premium fare for jets is possibly discriminating against a form of air transport which is not likely to prove more costly to operate, and will certainly be more comfortable and convenient, than the piston types which have established present fare levels. Furthermore, it is probably unwise to depart from the general downward trend in fares. A fare-differential is probably best applied as a discount for the turboprop types, in Canada and elsewhere, rather than as a premium upon jets. One can speculate here upon the possibility that the fare-differential may first become established in domestic conditions, where one sovereign regulatory agency—such as Canada's Air Transport Board or America's C.A.B.—is the arbiter of what is economic.

Desirability of Competition

The main body of the report, as its terms of reference suggest, is divided into (1) The desirability of competition, and (2) The economic consequences of competition. In an introduction, the author discusses public policy towards air transport; defines competition; and discusses airline competition in the U.S.A. In the last-named section the following statement is worth quotation:—

"The experience of airline competition in the United States in the past ten years ought not therefore to be taken to indicate that the *presumption in favour of competition* is mistaken. It must, however, be taken as a warning that the judgment of the circumstances in which competition is desirable is a very difficult one to make and that adverse consequences may easily follow from an over-optimistic evaluation of the presumption."

The author examines the likely advantages of competition. More adequate service might result in better load factors, frequencies, direct flights and choice of classes, and competition might indeed have a beneficial affect in these respects. But, on the other hand, "there are serious dangers that unrestricted competition may lead to adverse results." It would be the duty of the regulatory agency to avoid this.

More efficient service, as a result of the competitive stimulus, is likely to be provided. However, the report notes: "One of the major problems of the airline operations in the international field is that the I.A.T.A. system of regulating fares and rates tends to turn competition towards the quality aspects of service and . . . an increase in costs."

More rapid traffic development, another possible benefit of competition, is one of C.P.A.L.'s strong arguments for a share of transcontinental service. We recall Mr. McConachie's remark: "Our contention is that competitive selling, advertising publicity and service will develop the whole Canadian air transport market. More people will travel and the airlines will get a greater share of the whole common carrier market." However, Wheatcroft does not believe that competition *in itself* stimulates more rapid traffic growth. He points out that it is too often assumed that there is some magic about competition which is enough, by itself, to induce more people to travel. It is necessary first to prove that improvements in the quality of service will result.

A yardstick of efficiency is a clear advantage provided by competition, and so, concludes the report, is the satisfaction of choice which is "the strongest argument in favour of competition." The report points out how, in the absence of the right to choose, the passenger often magnifies small complaints against the monopoly carrier.

The report then considers T.C.A.'s record. It concludes that this airline's load factors have often been higher than is necessary for adequate service and that there is a *prima facie* case for believing the traffic has been turned away. Between 1954 and 1957 T.C.A.'s North American services operated for several months each year at load factors higher than 75 per cent. However, T.C.A.'s methods (e.g., scheduling) have been as advanced as those of other airlines. Further, T.C.A. have planned their expansion on a load factor of 68 per cent as a basis for new capacity on order. On the other hand, a most serious weakness was T.C.A.'s low level of frequency—"over half the sectors have a frequency less than half the number assessed [by the report] as commercially desirable." Further, it is concluded that T.C.A. were slower to introduce and develop low fare tourist class services in Canada than they might have been had they had competition.

But it is, the report says, in the direction of increased frequencies, rather than in new direct flight connections, that competition might do most to improve the adequacy and convenience of Canadian air services. On the score of the many criticisms of T.C.A.'s service, the report concludes that these services are operated to a standard which compares favourably with other airlines, and that there was no evidence that T.C.A. made more mistakes than other airlines.

A comparison of T.C.A.'s operating costs with those of airlines serving the same kinds of routes in other parts of the world concludes that T.C.A.'s costs are higher than those in the U.S.A. (see table), largely because of the lower average traffic density of Canadian operations.

The author lays great stress upon the effect on cost level of low traffic densities. He states that it is by an intensification of traffic density rather than competition which will reduce the level of Canadian air transport costs. The report also concludes that T.C.A.'s costs when compared with those of C.P.A.L. do not support the charge that T.C.A. were inefficient in Canadian conditions.

On the score of technological progress the report concludes that T.C.A.'s fleet was not competitive in the early 1950s but that the introduction of Super Constellations in 1954 and Viscounts in 1955 made T.C.A. North American leaders in aircraft progress. Further, it was clear from the present orders that T.C.A. were planning to maintain this leadership with an all-turbine fleet in 1961 of DC-8s, Vanguards and Viscounts. Competition might force the introduction of jets on sectors which T.C.A. have planned to operate with Vanguards, "but this may not necessarily be in the best public interest."

Traffic growth compared favourably with American and world average rates. For the future T.C.A. were assuming that traffic would continue to grow at an annual rate of more than 15 per cent up to 1960, that there would be a 23 per cent increase in 1961 when substantial fare reductions were planned, and that an increase of 12 per cent each year would be sustained during the subsequent five years.

Economic Consequences of Competition

The report next turns to the economic consequences of competition. It begins by noting that the advantages of competition as previously outlined "do not appear so great that they would be worthwhile irrespective of the risk of higher costs."

The influence of airline size on the level of costs indicated that, in the present technical state of industry, an airline operating more than 150 million C.T.M.s a year was large enough to enjoy all the current economies of scale. On the other hand, there were also clear indications that costs were likely to be significantly higher for small airlines and that, if the scale of operations was below 50 million available ton miles a year, the cost level per C.T.M. might be 25 per cent or more above that of airlines operating at the "optimum" size. T.C.A. operated 270 million C.T.M.s in 1957; if competition caused a reduction in T.C.A.'s operations this could well cause unit costs to rise "because there are certain airline costs from which it is difficult to escape as output is decreased." C.P.A.L. operated 66 million C.T.M.s in 1957.

C.P.A.L. have turned to this section of the report to argue that they should increase in size to enable them to approach more closely the economies of scale which T.C.A. already enjoy. But it is upon traffic intensity that the report lays most emphasis as a factor most influencing costs. Traffic intensity had "a very direct effect" upon the three most important cost factors in airline operation: aircraft productivity, station utilization and load factor. Aircraft productivity being determined by speed and payload, this was directly influenced by overall route traffic density. Station costs fell as the traffic throughput of the station increased; and load factor was of vital importance since experience showed that it was directly related—probably because of the ability to schedule more desirable frequencies—by higher traffic volumes.

The report goes on to determine the Canadian route traffic volume required to support competition. First, the minimum monthly pattern of traffic needed to sustain competitive services without cost increases are established in detail. With these are compared figures for the current volume of Canadian traffic. The conclusion is that there are only three sectors of the Canadian domestic system able now to sustain unrestricted competition without adverse economic consequences. These sectors are: Toronto - Montreal; Vancouver - Victoria; Toronto - Winnipeg.

For the future, the increase in average aircraft size was likely to be about two-thirds as large as the traffic growth. By 1966, however, traffic growth would be significantly greater than the increase in aircraft size. From this it seemed unlikely that there would be much change in the conclusion about competition applicable to 1957 in the years up to 1961. But by 1966 traffic ought to have increased very considerably

(*Continued on page 282*)

OPERATING COST COMPARISONS (cents per available ton mile)

Cost	T.C.A.[1]			U.S.		B.E.A.[4]	C.P.A.L.[5]			Cost
	Domestic	International	System	From[2]	To[3]		Domestic	International	System	
Depreciation	2.2	3.8	2.5	3.0	3.2	4.3	32.9	26.3	28.7	Aircraft operations and maintenance
Flying operations	8.8	8.5	8.7	8.1	8.2	11.5				
Maintenance	10.5	10.5	10.5	3.9	5.0	9.1	11.9	4.7	7.2	Ground operations and maintenance
Station costs	7.1	6.6	7.0	4.2	5.5	10.1				
Load costs	2.3	2.7	2.4	1.5	2.4	2.3				
Solicitation and ticketing	5.3	6.2	5.5	3.7	3.4	4.4	5.4	6.3	6.0	Traffic expenses
Administration	1.2	1.8	1.3	0.8	0.9	3.7	3.8	2.7	3.1	Administration
Total	37.4	40.1	37.9	25.2	28.6	45.4	54.0	40.0	45.0	Total

Notes: (1) Year 1957. (2) National Airlines—12 months ended June 30, 1957. (3) Capital Airlines—12 months ended June 30, 1957. (4) 12 months ended March 31, 1957. (5) Year 1957.

The flight-line at R.C.A.F. Station Cold Lake, Alberta, where aircraft using the nearby Primrose Lake weapons range are based.

COLD LAKE WARMS UP

—and prepares for the Arrow: a visit to the R.C.A.F. Weapons Range in Alberta

TAKE-OFF from Edmonton Airport and head north-east. In just under an hour as the Dakota flies you may well be cleared for a straight-in approach to one of two long runways forming a vee and bounding a further vee of hangars and a wide, well-planned array of barrack blocks, offices and other buildings. This highly organized community is set in the midst of a vast undeveloped area of muskeg and forest: a few miles away lie the shores of Cold Lake, from which the station takes its name.

The station is a unit of Air Defence Command of the Royal Canadian Air Force, and it has a twofold function. On the one hand it carries out operational and refresher weapons training for CF-100 crews and also trains ground controllers; and on the other hand it is the home of the Air Armament Evaluation Detachment of the Central Experimental and Proving Establishment. This latter reference means that the Cold Lake area will shortly become a very noisy place for the servicemen, trappers, Indians, pelicans, moose, bears and other local inhabitants, with the advent of the CF-105 Arrow on its weapon-firing trials. It also makes it well worth the while of a wandering English journalist to brave the twin hazards of mosquito-bites and station hospitality to learn something about the place.

It so happened that the nine two-man crews of Course 58 of No. 3 Operational Training Unit were celebrating their graduation on the evening of my arrival at Cold Lake. Commanded by W/C. E. W. Smith, D.S.O., the O.T.U. provides a 13-week course divided into basic, conversion, and advanced phases during which time crews are brought up to operational standard on the CF-100.

Students come to the O.T.U. either from the training pipeline or from other Commands. Pilots arrive at Cold Lake via a jet instrument course on T-33 "T-birds" at Saskatoon, and observers from the air-interception course using Mitchells at Winnipeg. An interesting feature of the O.T.U. course which has worked well is that the teaming-up of pilot and observer into CF-100 crew is left to the students themselves. Early experience on the course is gained in dual-control CF-100 Mk 3s and also on two of the CF-100 simulators built by Canadian Aviation Electronics at Montreal. On the Advanced Flight, interceptions and navigation exercises by day and night are practised until proficiency is complete, the course graduates, and the resident Avro Aircraft representative presents the students with their CF-100 lapel-pins in between speeches at the celebration party in the mess.

Refresher training in rocket-firing for operational CF-100 squadron personnel is provided at Cold Lake by the Weapons Practice Unit commanded by S/L. W. H. Vincent. Most of the two-week course consists of live attacks on "Radop" targets towed by T-33s over the Primrose weapons area, described later in this article. The radar reflectors inside the target, which resembles a 1,000 lb bomb, give a radarscope indication equivalent to that of a high-flying bomber. Two main safety precautions are taken: rocket-firing is carried out only when the towline weather is good; and the tow-plane as well as the target is first identified (the normal length of towline is 3,000-8,000ft).

Another unit works in conjunction with W.P.U. to give similar operational practice to the ground controllers who direct the aircraft on their rocket-firing runs. This is the Controller Proficiency Unit, which was established at the base in January of last year and is commanded by S/L. S. E. Collins. Controllers temporarily assigned to C.P.U. are evaluated simultaneously with the W.P.U. aircrew carrying out their live rocket firing.

At first sight it appears strange that the station's lodger unit, the Aircraft Armament Evaluation Detachment of the Central Experimental and Proving Establishment (a unit of Air Materiel Command) was in fact the first unit to be based at Cold Lake. This was in June 1954, when its job was the evaluation of the CF-100. The need for a weapons range where the R.C.A.F. could test its future rockets and missiles had earlier been realised in the selection of the Cold Lake area for such a range and its associated airfield site.

The weapons area itself is a wide strip of land, measuring 100 miles from east to west and 40 miles north-south, lying across the Alberta-Saskatchewan border on the 55th parallel. This is the general area in which the W.P.U. rocket-firing practice is carried out; while the Primrose evaluation range, a fully instrumented section based on Primrose Lake near the southern boundary of the range area, is the particular interest of the armament evaluation experts of C.E.P.E. It is here that the evaluation of CF-100 was carried out; it is currently the scene of the unit's work with the Canadair Argus; and it will be here that Canada's mightiest aircraft project yet, the Arrow, will be proved as a weapon system.

The R.C.A.F. approach to its evaluation of the Arrow, as described recently by S/L. A. W. Armstrong*, consists of eight stages of which the aircraft weapon-system is the subject of the seventh. In addition, at least two of the earlier phases will be carried out at Cold Lake.

The first phase, being carried out by Avro Aircraft at Malton at present, is devoted to airworthiness and equipment functioning. This initial flight programme is designed to check the aircraft as a flying machine over as much of the flight envelope as possible. This will be followed by the second phase, a preliminary R.C.A.F. evaluation, also at Malton, for the Service to obtain an initial first-hand appreciation of the handling characteristics and performance of the aircraft.

After a period for the checking of any modifications found necessary, the fourth phase will consist of complete performance and handling trials by the R.C.A.F. Fifth comes the all-weather evaluation; sixth a period of intensive flying trials; and seventh the aircraft weapon-system evaluation, covering the airborne part of the complete weapon-system and its kill capability against specified targets. Finally, operational suitability trials will check the complete weapon-system in the defence system as a whole, and will enable maximum-effectiveness tactics to be devised.

In this overall programme, phases 2, 4, 5 and 7 are the responsibility of C.E.P.E., of which the armament evaluation of phase 7 is by far the most complex part. The complete evaluation system which is needed, primarily for phase 7 but also for phases 4 and 5 —and which was being prepared at the time of my Cold Lake visit last month, has been indicated by S/L. Armstrong in the diagram on the opposite page.

The officer commanding the armament evaluation detachment at Cold Lake is W/C. R. D. H. Ellis, who took time off to show me the unit's facilities and to speak of its past, present and future work. Project K, the evaluation of the armament-control system of the CF-100, had been the first major project on which the group had cut its teeth. For the Defence Research Board, facilities had been provided for research and development work on Canada's Velvet Glove air-to-air missile, while the current primary project concerned the Canadair Argus.

This programme included a study of the trajectories of various stores dropped from an Argus over a full range of speeds and heights, with observation by means of the cine-theodolites fringing Primrose Lake and also specially mounted cameras in the weapons bays, at the rear of the engine nacelles and beneath the wings and fuselage of the aircraft.

Before heading for the base camp at Primrose Lake, we took a quick look at the detachment's facilities at its Cold Lake headquarters in No. 7 hangar. (There are, in fact, six hangars at Cold Lake, numbered 1, 2, 3, 4, 6 and 7.) Particularly impressive were the large photographic laboratory, the environmental test laboratory (including a large cold chamber, a smaller altitude/temperature chamber, and vibration rigs), the standards laboratory and the computer-equipped data-reduction section operated by Comput-

*"*The R.C.A.F. Approach to the Evaluation of a Supersonic Interceptor Armed with Air-to-air Guided Missiles," Canadian Aeronautical Journal, June 1958.*

ing Devices of Canada personnel. The unit has its own workshops and fire-control systems laboratory, and among the new facilities to be installed in the near future are loading and check-out sections for Sparrow 2 missiles and a check-out section for Ryan KDA-4 Firebee drones. Another facility near the airfield is a ground-firing range at Marie Creek known as the T-range: among the aircraft which have used this are the Hunter and Javelin during their cold-weather trials with C.E.P.E.

From Cold Lake we drove 25 miles to the Primrose Lake base camp along a wide, all-weather road cut through the thick forests of spruce and jack-pine. This road was completed only recently; in the early days of building and equipping the base camp the only effective means of transport was by float-equipped Otters; on the ground there was only a 40-mile bush trail—which could not be used except when the muskeg was frozen—leading from Cold Lake to Primrose Lake. The range area is an extremely isolated region, but a number of trappers, mink-ranchers, fishermen and Chippewa Indians previously lived there and were moved (and compensated) when the R.C.A.F. arrived. The local population remaining now includes gulls, loons, ducks, pelicans and moose —and a fair number of brown bears, who have been known to break into the base camp's kitchen refrigerators and to peer inquisitively in at operators manning the cine-theodolite posts.

There are nine of these white-domed theodolite stations fringing the south-western panhandle of Primrose Lake, each equipped with Contraves EOTS (electronic optical tracking system) equipment and each located next to a small observation tower. Film records from these stations, and information telemetred back to base, have formed the two main tools of the range to date. As indicated, the range is now being developed and its instrumentation will be more sophisticated to handle the Arrow/Sparrow programme. The cine-theodolites will be slaved to precision plotting radar focussed on aircraft, missile, or drone; the telemetry system is being improved; and an ambitious trials control centre is being built.

This control centre, which has been designed and is being built by Canadian Westinghouse engineers, was well-advanced in construction at the time of our visit. Its purpose is simply to give the people concerned with firing trials the information and the communication facilities on which effective overall control depends. This centre would normally be manned by a trials master (in overall control), target controller, aircraft controller, trial sponsor (such as company project engineer), instrumentation officer, trials photographic officer and range safety officer.

Near the control centre the tracking and acquisition radar equipment is being installed. On the crown of a hill (known locally as Mud Mountain) overlooking the base camp and the lake are located an 80ft observation tower with an unrestricted view over the test area; two buildings housing the VHF transmitters and receivers; and a firing pad and observation blockhouse for ground launching.

The background to these preparations for the entry of the Arrow into R.C.A.F. service is, of course, the base itself, R.C.A.F. Station Cold Lake, Alberta. Here an amazingly self-contained community has developed, with full and modern facilities, catering for some 2,000 Air Force personnel and about 3,000 other people such as dependents and company employees. Much of the credit for the progressive way in which the station has developed goes to G/C. R. C. "Dick" Stovel, A.F.C., commanding officer from September 1954 until last month. From the outset the station has had to be almost completely self-sufficient, for the only nearby communities are the two small villages of Grand Centre and Cold Lake, and two Indian reservations on the shores of the Lake.

Much effort and non-public-funds money have gone into improvements in the buildings and recreational facilities at the base, which covers about ten square miles. The result must be seen to be appreciated, but includes such things as a shopping centre, with supermarket; recreation centre with gymnasium and swimming pool; a golf course; flying club; ski club; auto-club with do-it-yourself repair facilities; wide-screen cinema; three schools and a large community centre. A mayor and community council have also been elected (with over 800 housing units, the Cold Lake community rates as the tenth largest in Alberta). The interior of the officers' mess has recently been re-styled under the imaginative design of an Edmonton architect, and its lounges now give the visitor the impression more of a luxury hotel than of a Service mess.

It will be some time before the R.C.A.F.'s first Arrow arrives at Hangar 7 at Cold Lake and the C.E.P.E. evaluation programme begins in earnest. Before that time, the Primrose Lake range will be used by specially equipped CF-100s firing Sparrow 2 missiles as part of the missile-development programme which will later converge on the aircraft programme. The Sparrow 2 test work has already begun with firings at the U.S.N. Missile Test Center at Point Mugu, California.

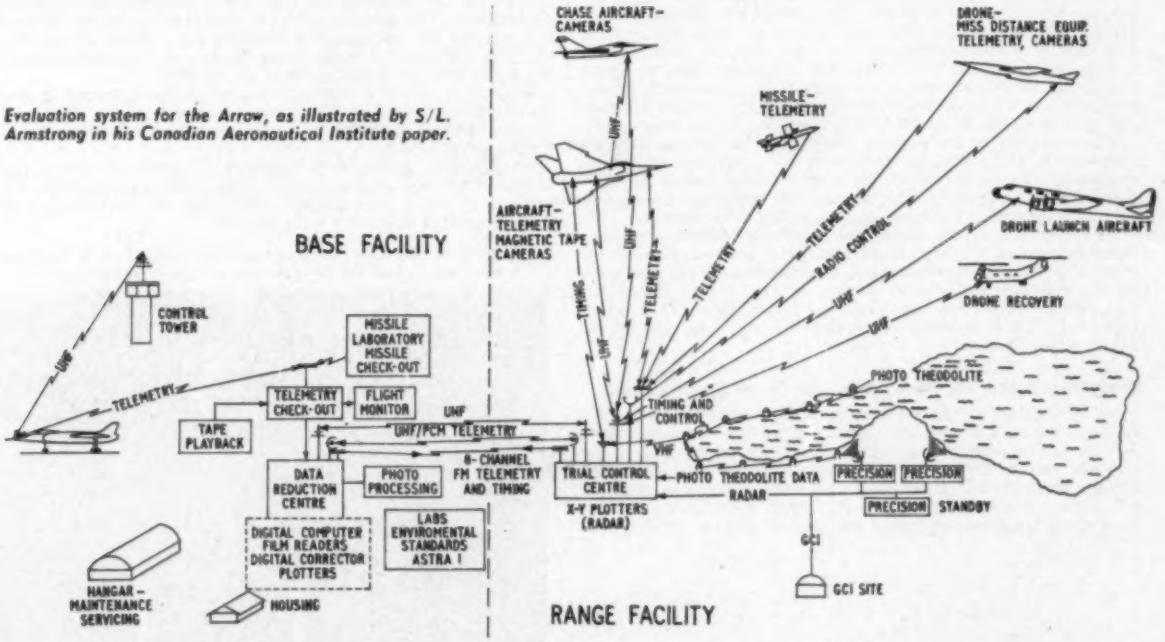
The Ryan Firebee drones will be launched from R.C.A.F. Lancasters: flight tests of this combination have recently been completed at U.S. Naval establishments at Brown Field and China Lake, California. Standard operating procedures have been devised and Cold Lake should receive its first Firebees later this year.

By next spring the re-shaped and improved facilities at Cold Lake and Primrose Lake should be in operation. At that time, not far from the scene of the Cree uprising during the rebellion of 1885, another phase in Canada's history will be marked—the establishment of what is probably the best air-to-air missile test range in North America.

KENNETH OWEN.

The emergency launch at Primrose Lake passes one of the nine cine-theodolite and observation posts located on the shores of the lake.

Evaluation system for the Arrow, as illustrated by S/L. Armstrong in his Canadian Aeronautical Institute paper.



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The Canadian Industry

Canadian Aero Service S-55 with triple geophysical installation.

Aluminum Company of Canada, Ltd., *1700 Sun Life Building, Montreal 2.*

THE year 1957 was a year of transition for the Aluminium, Ltd., group of companies and for the industry. The preceding ten years, with few exceptions, had been years of strong demand, full production and rapid expansion. In 1957, however, supply exceeded demand. Free-world production did not increase. While consumption in Europe and many other areas continued to grow, overall consumption dropped by about 3 per cent. The resulting decline in demand for primary metal led some companies, including Aluminium, Ltd., to retard their expansion programmes.

Capital expenditures in 1957 under the company's long-range expansion programme amounted to some $180,000,000, principally to provide new basic facilities for production of hydro-electric power and raw materials on which future smelting expansion may be based. No new addition to the company's Canadian smelting capacity was completed in 1957, although construction of potlines with an annual capacity of 80,000 short tons was continued at Kitimat, British Columbia, until October, when a decision was taken to defer their completion until demand increased.

Currently the company's Canadian smelters are operating at about 80 per cent of rated capacity, producing substantially as much metal as in the year of peak production.

The Aluminum Company of Canada, Ltd., produced 556,700 tons of primary aluminium during 1957, a 10 per cent reduction from the total production in 1956. Total power generation in the company's Quebec and British Columbia hydroelectric plants during 1957 was 14.1 billion kilowatt hours, or approximately 15 per cent of total power generation in Canada. A sixth generator was placed in operation at Kemano, B.C., in July, and a seventh in early 1958, giving total installed capacity there of 1,050,000 h.p.

Aviation Electric, Ltd., *P.O. Box 6102, Montreal.*

AMONG the developments at the main Aviation Electric plant at Montreal over the past year has been the addition of a 35,000 sq ft extension, housing an air-conditioned manufacturing machine-shop and test facilities. This brings the Montreal floor-space to 150,000 sq ft. The departments of sales and service, engineering, manufacturing and overhaul have all continued at a high level of activity. While the manufacturing emphasis remains on aircraft instruments, a range of fuel controls, hydraulic equipment, Scintilla electrical connectors, torpedo course controls, and specialized products for industry are also being produced.

The company is a Canadian affiliate of the **Bendix Aviation** Corporation and Canadian distributor for a number of British companies. Its current work includes the manufacture of components for the Sparrow 2 missile for the two main contractors on this programme, Canadair and Canadian Westinghouse.

At Vancouver Airport, **Aviation Electric Pacific, Ltd.,** has recently installed a comprehensive range of new test equipment. Most of these new rigs are aimed at providing overhaul support for the hydraulic and control systems of the C.P.A.L. Britannias. Agreements have been concluded for this work with the main suppliers of these systems, Teddington Aircraft Controls, British Messier and Plessey.

Canadian Aero Service, Ltd., *348 Queen Street, Ottawa.*

PROBABLY the only Canadian air-survey company to have operated extensively over the United Kingdom, Canadian Aero Service has continued to expand its new technical services during the past twelve months, while completing a heavy schedule of foreign and domestic assignments. Towards the end of last year a London office was opened, an agreement with Geoprosco was announced whereby integrated air/ground surveys and services could be provided, and the company's association with Spartan Air Services was terminated.

At Carp Airport, near Ottawa, the Canadian Aero Service fleet of aircraft (operated by Bradley Air Services) includes the ingeniously triple-equipped S-55 helicopter, which passed from the parent U.S. company Aero Service to C.A.S. ownership a year ago. This machine carries an in-phase and out-of-phase electromagnetic detector (transmitter coil on the large front boom; receiver coil on tail-boom); a magnetometer (with "bird" fixed underneath the helicopter); and an internally mounted scintillation counter, in addition to recording equipment and cameras.

The helicopter can fly at a constant height (above the ground), and at a relatively low height, over hilly or irregular terrain, and it is here that its advantage over fixed-wing types is displayed. The use of Canadian Aero's S-55 has reduced considerably the amount of ground follow-up work required.

The company has made available a comprehensive pre-engineering service which has proved especially valuable for route-location surveys. Photogrammetric mapping, resistivity checks and photo-interpretation are able to yield important information in the selection of a route for a highway, or an industrial site. Where the terrain permits, ground-control surveys are speeded by use of the tellurometer.

When a route construction project begins, the photogrammetrist continues to play an important rôle. The use of co-ordinate printers in conjunction with first-order stereo-plotting equipment develops cross-section computation results with a speed and accuracy previously impossible.

Adding to its record of over a million miles of airborne geophysical survey, Canadian Aero has in recent months flown some 50,000 line miles. Contracts have been fulfilled in the United Kingdom, Sierra Leone, Libya, Guatemala and in many areas of Canada. At the present time a magnetometer survey of 13,000 square miles of the North Midlands and the Irish Sea is being carried out by Canadian Aero for the Geological Survey, South Kensington. The specially equipped Anson which Derby Aviation has operated for the Canadian company on a variety of jobs over the past few years is again being used, and a second Anson is being prepared for future work of this nature.

Early this spring, a company aircraft utilized Shoran in conducting a magnetometer survey over the Great Lakes. The use of Shoran enabled geophysicists to pinpoint magnetic anomalies on hydrographic maps.

As licensees for the Towill process, Canadian Aero this year began producing photo-contour maps—true orthographic projections of aerial photographs. This type of map has proved invaluable as a field map for engineers.

J. F. Tooley of Canadian Aviation Electronics and Capt. D. MacLean of C.P.A.L. with DC-6B simulator at Vancouver Airport.

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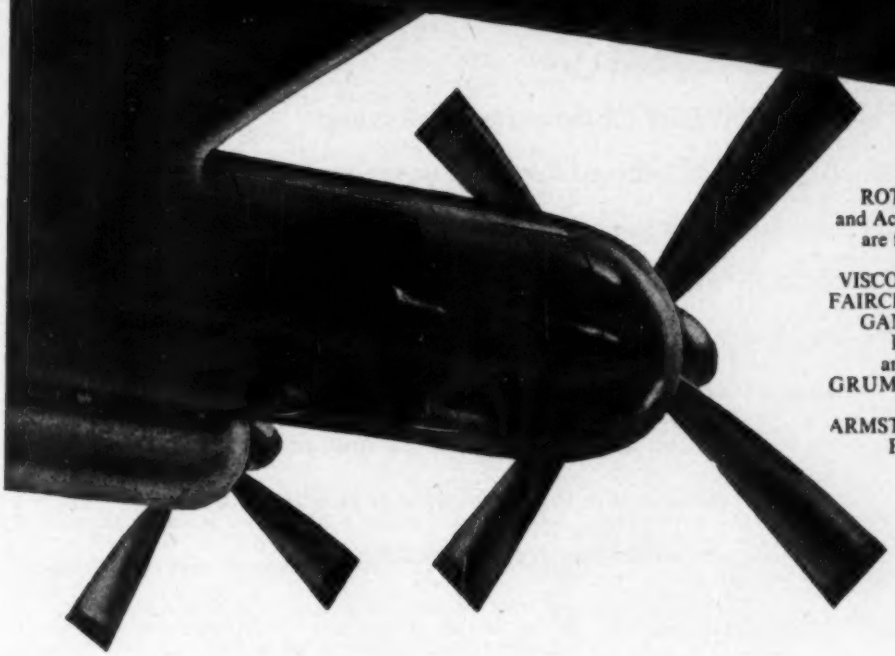

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The Canadian Industry . . .

Canadian Aviation Electronics, Ltd., *P.O. Box 915, Station O, Montreal 9.*

A CHANGE of top management and a general strengthening of the company's position in the field of flight-simulator engineering and manufacture have been two aspects of C.A.E. activities over the past year. The original order for the manufacture of eleven CF-100 Mk 4 flight and weapons system simulators for the R.C.A.F. has been completed, including a Mk 5 conversion for delivery to the Belgian Air Force. These simulators are now in service, and C.A.E. service representatives are assisting in their maintenance.

A major event for Canada's electronics industry was the delivery of the first commercial flight simulator to be built in Canada—a Curtiss Wright DC-6B simulator licence-built by C.A.E. for Canadian Pacific Air Lines, and now installed at the airline's training centre at Vancouver Airport (photograph on previous page).

Work on two new R.C.A.F. contracts was in hand at C.A.E.'s main plant at Montreal at the time of *Flight*'s visit last month. The first of these was for the manufacture of 12 general-purpose, twin-engined, flight and instrument-procedure trainers. This contract was received at the end of last year and delivery of the first trainer is planned for December next.

The second project is the manufacture of an operational flight trainer for the Canadair CL-28 Argus. This aircraft is also the subject of a design study by C.A.E. for a tactical crew-procedure trainer which would simulate the complete radar and weapons system.

The other major area of C.A.E. activity concerns the maintenance, repair and overhaul of the Hughes MG-2 radar fire-control equipment for the CF-100. The Montreal plant functions as the base repair and overhaul depot, while C.A.E. service teams maintain the MG-2 system in the field at squadron and flight-line level. A group of Belgian Air Force technicians completed a course at Montreal two months ago, and Belgian technicians are eventually to take over from the company service representatives in Belgium the maintenance of the fire-control equipment of the Belgian Air Force CF-100s.

The Winnipeg plant of C.A.E. has seen an expansion of its maintenance and repair and overhaul work on the Pinetree line.

The founder of Canadian Aviation Electronics, K. R. Patrick, O.B.E., resigned as president in January and his place was taken by James F. Tooley, formerly vice-president, finance, of Canadair. The company has a total work force of 1,000 employees.

Canadian Marconi Company, *2442 Trenton Avenue, Montreal.*

THE latter half of 1957 and the first half of 1958 saw "tremendous developments" in the aviation department of Canadian Marconi, according to a recent company statement. While other divisions of the company consolidated a firmly established position in the electronic field, the aviation department began to apply its developments in field trials and evaluation of the advanced Doppler navigation sensor; and in continued success with the CMA-301 automatic direction finder; the CMA-402 loudhailer; and the CMA-101/201 HF transmitter/receiver.

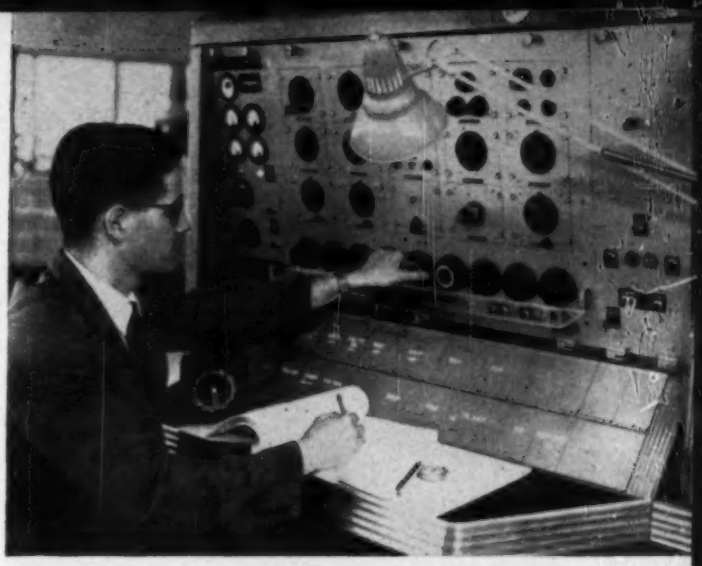
Important work has been done in other fields (notably radio relay, forward scatter, mobile radio, single sideband and radar), but the outstanding development from an aviation viewpoint has been the emergence of the successful Doppler sensor known as DAGMAR (Drift and Groundspeed Measuring Airborne Radar), work on which was initiated and sustained with active support of the Defence Research Board and the R.C.A.F.

A number of major world airlines are conducting evaluation trials of the civil airline version of the Canadian Marconi equipment with significant and successful results. CMA-621, to give it its type designation, is claimed to be the first commercial airborne navigational aid reflecting absolute independence of special ground-aids and capable of a degree of accuracy and reliability to an extent hitherto unknown.

There has been evidence during the past year of the increased importance of the company's affiliation with the English Electric group of companies, and also closer collaboration, resulting in an interchange of technical development, with other electronic companies in the United Kingdom.

Canadian Westinghouse Co., Ltd., *P.O. Box 510, Hamilton, Ontario.*

ONE of the two main contractors on the Sparrow 2 programme (the other being Canadair, Ltd.), Canadian Westinghouse is responsible for the complete guidance system of this missile. Part of this work has been subcontracted by the company to Computing Devices and to Aviation Electric. The original U.S. Sparrow 2 is believed to have had fully active homing radar, produced by Bendix.



ANTAC test console at Computing Devices of Canada plant, Ottawa.

The company, an associate of the Westinghouse Electric Corporation, U.S.A., produces a range of airborne and ground electronic equipment for aircraft and guided missiles. Its manufacturing sections are backed by extensive environmental-test and analogue-computer facilities.

Collins Radio Company of Canada, Ltd., *11 Bermondsey Road, Toronto 16.*

THE main production programme during 1958 in the Collins Toronto plant has been devoted to the AN/ARC-38 35,000-channel HF transceiver. This equipment has been installed in a number of R.C.A.F. aircraft, including the Argus. Production planning is now well advanced for the AN/ARC-552 1,750 channel UHF transceiver. This equipment will be fitted to all R.C.A.F. aircraft in place of the present VHF airborne transceiver.

The company has also development contracts for control systems associated with the ARC-552 installation in a number of aircraft.

A very complete range of Collins equipment is on order for the Canadair CL-44 transport; this includes the FD-105 integrated flight system, 51X-2/17L-7 VHF communications, VOR-101 navigation and glide-slope receivers, passenger-address amplifier, UHF and HF transceivers. Collins equipment is also on order for the Canadair CL-41 and de Havilland Caribou prototype aircraft.

Production of commercial ground and airborne communications equipment continues to be shipped to many foreign countries. General manager and director of engineering is J. P. Giacoletto.

Computing Devices of Canada, Ltd., *P.O. Box 508, Ottawa 4.*

THE opening of a third building, of 75,000 sq ft floorspace, at C.D.C.'s main plant at Ottawa, and the company's entry into the commercial aircraft navigation field with its Skyline equipment, are two new features of C.D.C. activity over the past twelve months. Employment has increased during the year and now totals approximately 560. The broad theme of the company's operations continues to be the development and manufacture of aircraft navigation systems.

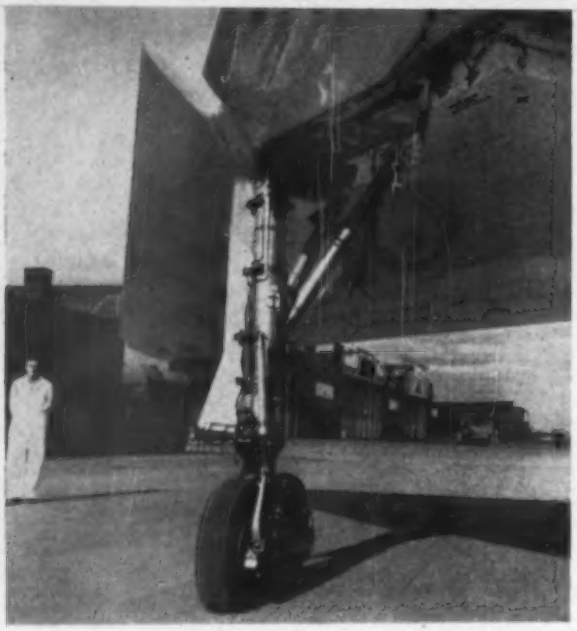
The Mk 3 version of the company's Position and Homing Indicator is at present under evaluation by a number of NATO countries as a standard navigation system for single-seat fighter aircraft. R.C.A.F. flight trials of the P.H.I., using T-33 and Sabre aircraft, began last month.

The operating principles of the P.H.I. have been described before in *Flight*. It is an automatic dead-reckoning instrument which presents the pilot with course and distance to any one of five destinations selected with push-buttons. The system weighs less than 25 pounds, and all electronics are transistorized. The company expects to put the Mk 3 into production in the near future.

ANTAC (Air Navigation and Tactical Control system) is a complex navigation system now in production for the Canadair Argus and CL-44. Almost completely automatic, it is primarily a long-range dead-reckoning navigation system with provision for coupling to Doppler radar, TACAN and conventional radio aids where available.

The ANTAC system consists of a number of major sub-systems, each of which was a substantial development project in itself. One of these sub-systems is the master direction corrector, which generates all aircraft heading information, supplies correction as needed, and transmits the type of heading required for each different crew member or function in the aircraft.

To check on the heading system, a synchronous astro-compass



Avro Arrow main landing gear by Dowty Equipment of Canada.

system is included. With this, a pilot can make a quick simple check through a servo-driven periscopic sextant on the azimuth of a preselected star to determine if the heading information is correct.

The integrated destination indicator uses heading information from the master direction corrector, and position information from the dead-reckoning computer, to supply heading, bearing, and distance information to the pilots. In addition to the long-range navigation features, a short-range tactical navigation system is also included.

Testing of the ANTAC system is simplified by the use of special test consoles developed and manufactured by C.D.C. These have been designed to check the operation of individual units and of the ANTAC system as a whole.

The company's entry into the commercial aircraft navigation field is the Skyline Doppler computer and presentation system. It is currently under evaluation by several airlines, and has been successfully flight-tested in T.C.A. Super Constellations and T.W.A. and Swissair DC-7C aircraft. The main feature of the Skyline system is the convenience of its presentation system, which displays distance gone; distance to go; and offset right or left from a pre-set track.

Skyline consists of three units, as well as the Doppler radar itself. These units are a computer (which may be mounted in any remote position); a track position indicator (which displays track angle, distance gone, and offset from 0 to 99 miles); and a pilot indicator, which displays relative track, distance to go, and offset from 0 to 3 miles.

Development work continues on Astra, an advanced navigation and intercept system for the CF-105 Arrow. In the guided missile field, C.D.C. is manufacturing components of the Sparrow 2 missile under subcontract to Canadian Westinghouse, and has been given a contract for data-reduction work at the R.C.A.F. station at Cold Lake, Alberta.

Sale and installation negotiations have been completed by Computing Devices for the Bendix RDR-1 weather radar being supplied for T.C.A.'s Viscount fleet. First deliveries were due this month.

Dowty Equipment of Canada, Ltd., *Ajax, Ontario.*

A YEAR of vigorous and diverse engineering activity is reported by Dowty, who have produced original equipment (ranging from small selector valves to complete landing gear) for each of Canada's four main aircraft and engine companies: Avro Aircraft, Canadair, de Havilland and Orenda Engines.

The most challenging recent design achieved by the company was that of the main undercarriage gear for the Avro Aircraft CF-105 Arrow. The units are mechanically complex, the main legs are long and highly stressed, and the chief components are of ultra-high-strength steel. Qualification testing of the Arrow landing gear and hydraulic system is continuing, and fatigue testing of the complete landing gear is now under way, as part of the normal development. By the beginning of this month, eight aircraft sets had been delivered.

Following the recent landing accident to the prototype Arrow, when the aircraft touched down with the port mainwheels inclined at 30 deg to the runway direction following a jammed linkage in the leg-twisting mechanism, intensive work by Dowty engineers has produced a number of revised schemes which have been discussed with Avro Aircraft. The company are confident that the problem has been overcome and, while there will be some

delay in the final assembly of Mk 2 main gears, there should be no difficulty in meeting the Arrow's production schedule. Another modification to the undercarriage design resulted from a change in the strength requirement specified by Avro following complete static tests at a relatively late date.

Development and qualification testing of electro-hydraulic selector valves, with flows up to 40 gal/min and a temperature range of −65 to 275 deg F, for the Arrow's 4,000 lb/sq in hydraulic system, and of hydraulic and electro-hydraulic components for the Caribou, CL-44 and CL-41 and Iroquois is in progress.

Of particular interest are the hydraulic power pack and flap actuator and control for the Caribou, and the actuator/control valve for the Iroquois engine. The Caribou power pack is virtually a complete hydraulic system. Weighing only 64 lb, it contains in a small envelope a combined hydraulic reservoir and accumulator with its own pump, relief valves, pressure switches and gauges. The Caribou flap actuator and control actuates from one unit the complete double-slotted flap mechanism and embodies a preselector control valve interconnected with engine throttles, tailplane and wing leading-edge. The actuator/control for Orenda Engines is a small high-temperature actuator with an integral solenoid-operated valve.

A varied programme of applied research (e.g. into high- and low-temperature components) is being carried out, together with a materials and processing test programme. On the manufacturing side, a range of landing gears, hydraulic, electro-hydraulic and pneumatic system components, and Dunlop wheels, brakes and Maxaret units have been produced for the CF-105, CF-100, CL-28, CL-44, CL-41, CS2F, Beaver and Caribou. Technical service representation in the field, and overhaul and repair work, continue to be other important aspects of the company's work.

A subsidiary company, Cameloid, Ltd., now provides facilities for chemical and electro-chemical protective processes for metals, with an additional 10,000 sq ft of floorspace in a new factory on the Slough Estate at Ajax. Approximately 400 people are employed at Dowty's three Ajax plants which cover a total of 80,000 sq ft.

Enheat Aircraft (Aircraft Division of Enamel and Heating Products, Ltd.), *Amherst, Nova Scotia.*

THE largest current project at the 288,000 sq ft Enheat plant at Amherst is the manufacture of the empennage and aft fuselage units for the CS2F Tracker. By this month 67 empennage sets will have been delivered, out of a total contract of 100. Enheat are producing 57 aft fuselages at the rate of two per month for de Havilland Aircraft of Canada, the prime contractor, with 25 delivered to date. Work on the CS2F is being carried even further; repairs and modifications to this aircraft are commencing. The company is also under contract to Avro Aircraft to handle machining of certain essentials for the CF-105 Arrow.

Component repair and overhaul work is continuing on R.C.A.F. Neptunes and Lancasters and R.C.N. Banshees and Trackers.

Garrett Manufacturing Corporation of Canada, Ltd., *4 Racine Road, Rexdale, Ontario.*

DURING the past year this company (the Canadian subsidiary of the Garrett Corporation of Los Angeles) has substantially increased its engineering services and capabilities to fit in with the expansion of its test, overhaul and manufacturing facilities. This growth in the organization has been reflected by an increase of 100 per cent in the number of employees.

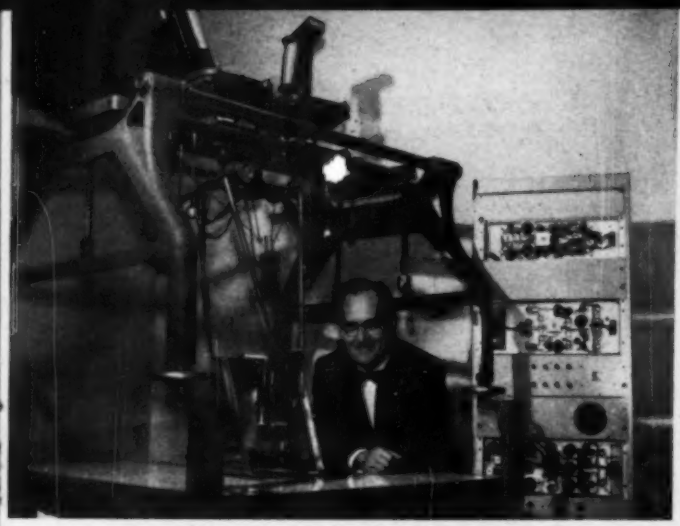
Garrett has participated extensively in the development of specialized components for use in new Canadian aircraft. Among components which have been supplied are air turbine starters, cooling turbines, gas turbine compressors, heat exchangers, control valves, flying control systems, temperature control systems, radio compass controls and other items for the CF-105 Arrow; trim and spoiler actuators, flow control valves, magnetic amplifier temperature controls and other items for the Argus; and heat exchangers, surface temperature and oil temperature controls, air turbine starters and other items for the Iroquois. The company is also producing computing systems for use in the CF-100 command limit servo system.

Hunting Associates, Ltd., *1450 O'Connor Drive, Toronto 16.*

THE member-companies of the Canadian Hunting Group have been fortunate in maintaining a satisfactory volume of business in spite of a year of general economic recession. The activities of the companies are described below and on the next page.

Hunting Associates, Ltd., have recently also acquired small interests in two companies in the United States. These are Photronix, Inc., of Columbus, Ohio, and the recently formed Hunting Geophysical Services, Inc., which is operating out of Rochester, N.Y., with a Canso aircraft equipped with geophysical instruments.

The Photographic Survey Corporation, Ltd., *1450 O'Connor Drive, Toronto 16.*—This company's operations extend across



Photographic Survey Corporation designer of AUSCOR (automatic scanning correlator), Gil Hobrugh, with Kelsh plotter adaptation.

Canada from the Maritimes to Aklavik in the Northwest Territories. In the Arctic two Fortress aircraft are based in Baffinland on a 220,000 square mile survey of the Arctic islands for the Canadian Government.

In co-operation with two associate companies, P.S.C. is conducting a major resources survey in Bolivia. The work is being carried out for a number of oil companies, and includes aerial photography, topographic mapping, mosaics, astro control, airborne magnetics and geophysics.

Earlier this year P.S.C. set up a research advisory committee to implement the policy of the Canadian Hunting Group of greater emphasis on research for the future. The successful adoption last year of the Photronix process, which combines photogrammetry with electronic computing methods, has greatly speeded up the design engineering of highway projects and has been followed by another major development in the field of electronics. The latter, a device known as AUSCOR (Automatic Scanning Correlator), achieves automatic correlation of stereo images.

Hunting Airborne Geophysics, Ltd. *1450 O'Connor Drive, Toronto 16.*—Hunting Airborne Geophysics (formerly Aeromagnetic Surveys, Ltd.) is continuing to expand its geophysical operations throughout the world, and although there has been a noticeable decrease in mining operations, there has been a marked increase in work for petroleum companies. In Canada the company's aircraft are operating across the continent. In central Ontario and Quebec combined surveys are being carried out by a Canso aircraft equipped with magnetometer, electromagnetometer and scintillation counter. A large helicopter-borne magnetic operation is being undertaken in Labrador, and in the far Northwest Territories a Lockheed 14 aircraft, based at Aklavik, is making a magnetometer survey for oil in the Mackenzie Valley.

A Canso has recently completed a magnetometer survey in Ceylon, as part of the Canadian Colombo Plan project for a resources inventory of the island.

A major contract for H.A.G.L. in 1958 is its part in the combined survey now being undertaken in Bolivia in conjunction with P.S.C. and Hunting Technical and Exploration Services.

Jarry executives with Caribou landing gear: (from left) John Truron, Fernand Jarry (president), Adolbert Jarry and Leo Vadebonceur.

Hunting Technical and Exploration Services, Ltd., *1450 O'Connor Drive, Toronto 16.*—This company has greatly increased its technical staff in the past months in order to keep up with the expansion of business in its various resources fields, the two most successful of these being geophysics and engineering.

Increased domestic geophysical work is directly related to the upsurge in airborne geophysical work for the petroleum industry. As a logical follow-up to these airborne surveys H.T.E.S. provide detailed interpretation of results.

H.T.E.S. is partaking in several major resources contracts, including two under the Canadian Colombo Plan. Work on the first of these, in Pakistan, is near completion.

The second Colombo Plan project is in Ceylon. Here work is continuing, and an extension to the contract has made it possible to project plans for this year and next in the fields of geology, geophysics, soils and land use and forestry.

In South America H.T.E.S. is actively engaged in resources surveys in Venezuela and Bolivia, and the future dictates an ever increasing amount of work in forestry and agriculture in Latin and South America. A contract has recently been signed with a major U.S. oil company for geological mapping of five areas totalling some 2,000 square miles in the Philippines.

Kenting Aviation, Ltd., *Oshawa Airport, Ontario.*—The aircraft engaged on all the projects mentioned above under the separate Hunting company headings are operated for the group by Kenting Aviation.

Last year Kenting flew some 200,000 line miles of photography and logged more than 6,000 hours flying time. There are 75 aircrew on the company payroll, and they have flown from the Arctic to Antarctica, and from all seven continents, in the past eleven years.

Kenting Helicopters, Ltd., *Oshawa Airport, Ontario.*—After a successful year of operating three S-55 helicopters on a DEWline re-supply contract, Kenting Helicopters, Ltd., are now concentrating on heavy transportation, and are planning long-term contracts in any part of the world.

The three S-55s, which can each carry a 1,000 lb load, are fully equipped with flotation gear, skids and wheels, and are capable of carrying sling load attachments.

Field Aviation Company, Ltd., *Oshawa Airport, Ontario.*—*A* recent reorganization of Field Aviation has placed the company's activities into four main operating divisions: civil maintenance; military maintenance; agency and supply; and aircraft sales.

The civil maintenance division, which includes hangarage and light manufacturing, operates mainly at the company's headquarters at Oshawa Airport. However, Field have recently put in hand the construction of a new hangar at Calgary adjacent to the new terminal building at McCall Field, which will extend their maintenance activities in the west.

Military maintenance continues with a long-term contract for the R.C.A.F. for storage/inhibiting and radio servicing, which provides work at Oshawa and at three Air Force bases. Recently important export contracts have been carried out for the West German Government for supplying safety equipment.

Agency and supply sales have greatly increased, and Field have established a retail organization across Canada for aircraft supplies and parts. The headquarters for this division is now in Ottawa, which is linked by teleprinter with branches in Oshawa, Winnipeg, Calgary and Vancouver.

Jarry Hydraulics, Division of Jarry Automobile, Ltd., *4384 rue St. Denis, Montreal 18.*

JARRY'S new 18,000 sq ft landing-gear shop, equipped with over 50 large machine tools, commenced full operation at the beginning of this year. This plant, brought into use primarily to cater for the heavy forgings in the Argus landing gear, will be used for heavy machining work on the company's CL-44, Arrow and Caribou programmes. It is located at Rachel Street, separate from, but in the same district of Montreal as, the main production shops, test and stores sections.

There are few, if any, of Canada's current and forthcoming aircraft programmes which do not involve Jarry Hydraulics, and by referring to these machines in turn a good idea can be obtained of the company's progress over the past year.

Six sets of the nosewheel gear and hydraulic components for the CF-105 Arrow have been produced; qualification testing of the nose-gear and of a number of the other units is complete. These other units include powered controls for rudder, elevator and aileron; speed-brake jacks; main-undercarriage jacks and up-locks. Jarry have designed and built the complete landing gear for the prototype DHC.4 Caribou now flying; the nose-gear (including the company's patented steering system) has been fully qualified, and the main gear continues on test. It is the company's intention

The Canadian Industry . . .

to patent this STOL type of gear, which in the Caribou is designed to accept a vertical landing velocity up to 17.4ft/sec.

For Canadair, the company is producing main and nose undercarriage (of basic Messier design, re-engineered by Canadair); steering cylinder; main retraction cylinder; up-lock jacks; and Hobson feel-simulator — plus Jarry-designed ball-screw flap actuators—for the CL-28 Argus: and new units for the CL-44, similar in function, have been designed and are being made and tested. The complete landing gear for the prototype CL-41 has been completed, and the nose gear for the diminutive jet trainer has made a distinct change in the appearance of Jarry's drop-test rig, which has previously catered for much more massive items.

Other production programmes continue as reported last year, including the licence-manufacture of the Bendix main undercarriage for the CS2F Tracker. In view of the volume of aircraft business on hand, a further physical expansion by Jarry would seem a logical step in the near future.

Walter Kidde and Company of Canada, Ltd., *5500 Royalmount Avenue, Montreal 9.*

A DISTRICT office in Vancouver, as well as one in Toronto, is now in operation for the Canadian Kidde company, a subsidiary of Walter Kidde and Co., Inc., of Belleville, N.J. The main manufacturing plant at Montreal, the outcome of continuous expansion since the company's formation in 1928, has 20,000 sq ft of floorspace. Surrounding the factory is a further 70,000 sq ft of company-owned land available for further expansion.

All phases of fire protection for aircraft are being handled by the Kidde companies, in addition to pneumatics, high-temperature equipment, inflation gear for life-saving equipment, and auxiliary power units. For ten years Kidde has been engaged in monofuel a.p.u. research programmes, which have resulted in the development of lightweight, self-contained auxiliary power supplies for guided missiles and supersonic piloted aircraft.

Walter Kidde and Company of Canada are approved by the R.C.A.F. for the repair and overhaul of the equipment manufactured by themselves and by the parent company in the U.S.A.

Lucas-Rotax, Ltd., *Box 115, Station H, Toronto 13.*

A NOTABLE development for Lucas-Rotax in Canada during the last year has been the start of work at the company's new 6,000 sq ft facility at Vancouver Airport. This overhaul and repair plant has been set up primarily to handle the Lucas and Rotax fuel and electrical systems of Canadian Pacific's Britannias. A number of units from the Britannias of Aeronaves de Mexico have already been overhauled at the Vancouver plant.

Having completed its contract for the complete generating system for the Arrow Mk 1, the company's main plant at Scarborough, near Toronto, has put forward a revised proposal for the Mk 2 version of this aircraft. This features a number of major design changes, including the introduction of an oil-cooled environment-free 40-kVA alternator weighing only 87 lb. This is the first such machine to be produced in Canada, and was developed from a 1939 Lucas patent. All sliding contacts have been eliminated and consequently brushwear and radio interference are no longer problems.

A further development has been a new transformer rectifier unit employing the latest techniques in static regulators and proven silicone rectifiers and conservatively rated at 4½ kW, 28 volt.

In the field of fuel systems, the Lucas-Rotax picture remains unchanged from last year, with the main engineering effort being devoted to further development and production of the Iroquois fuel system with a bleed-air turbopump.

With the main Toronto activity concentrated on the engineering of new products and on the manufacture of experimental and prototype hardware, the production shops are considerably underutilized at present, following the phasing-out of the Orenda engines. A healthy volume of future production is envisaged, however, and the company is prepared to diversify its operations provided its basic aircraft work is not thereby jeopardised.

At the overhaul and repair establishment at Montreal work continues on fuel systems and aircraft electrics for the Orenda, Nene, Dart, Merlin and J34 engines; and Viscount and T-33 aircraft. Employment totals at Montreal and Scarborough are now 200 and 800 respectively, the latter figure including 135 in the engineering departments.

Martin-Baker Aircraft Company, Ltd., *Collingwood, Ontario.*

THIS company has been fully engaged in modifying the existing Martin-Baker ejector seats fitted to Avro Aircraft CF-100s. The modifications have been designed to improve the capabilities of the seat by introducing the company's new long-stroke gun, a new extended headrest and an alternate firing system. The new gun brings the safe ejection altitude down to 50ft; the new extended headrest enables the pilot and navigator to reach the blind handle more easily; and the alternate firing is designed for emergencies in those cases when either the pilot or navigator, for some reason or other, cannot reach above his head for the blind handle.

New Lucas-Rotax branch plant at Vancouver Airport.

At present the company is carrying out preliminary work for future modifications to give the seat a ground-level ejection capability, and it is expected that these modifications will begin early this winter.

Normalair (Canada), Ltd., *P.O. Box 9, Station N, Toronto 14.*

THE company continues to provide supporting services for Normalair equipment used in British aircraft operated in North, Central and South America. With factory space and offices in Toronto, it is able to undertake the servicing, repair and overhaul of such equipment, and also to provide advice to operators handling their own overhaul work. Among the several operators who have been helped in this latter way are Capital Airlines and T.C.A. in connection with their Viscounts.

Normalair (Canada) is also able to undertake limited production in its own factory, and several components for the Arrow are currently being built.

Northwest Industries, Ltd., *P.O. Box 517, Edmonton, Alberta.*

AT the Northwest plant on Edmonton Airport a recent project has been the installation of Collins ILS and VOR test and calibration equipment in nine Department of Transport Beech 18s by the company's electronics and instrument division. Work is going ahead towards the development of an electronics repair and installation facility for commercial aircraft.

Overhaul and modification work continues, though at a reduced rate, on C-119 and T-33 aircraft of the R.C.A.F. and on commercially operated machines.

Servomechanisms (Canada), Ltd., *Rexdale Boulevard and Kipling Avenue, Toronto 15.*

SERVOMECHANISMS (Canada), Ltd., is actively participating in the most advanced airborne control and instrumentation project in Canada, and is also marketing several proprietary products for both non-military aircraft and ground applications outside the aircraft field.

The company's sales for 1958 will unquestionably be the largest in its five years of activity in Canada. A substantial factor in achieving this has been the growth and diversification of export business. Believing that diversification of markets, as well as products, is essential to stabilizing the company's activities, the organization has aggressively pursued both these vertical and horizontal forms of diversification.

During the first six months of 1958, the company has shipped to Australia, Germany, Italy, Japan, Norway, the United Kingdom and the United States. A representative agreement for the British Isles and Europe has recently been concluded with the firm of Matériels et Constructions, S.A., 15 Rue de la Faisanderie, Paris XVI; the company has a licence agreement with the Mitsubishi Electric Manufacturing Company in Japan; and is negotiating for active distribution in other parts of the world. As well as distributing its own products, Servomechanisms (Canada), Ltd., is the sole outlet for the foreign activities of Servomechanisms, Inc., of Hawthorne, California, and Westbury, New York. The company looks forward to the consummation of cross-licence agreements to make available in Canada the engineering developments of complementary companies in England and other industrial countries.

Servomechanisms' modern plant in the northwestern suburbs of Toronto, near Malton Airport, offers a complete and effective source for both design and production of all of the company's products. Facilities and equipment are continually being improved.

Simmonds Aerocessories of Canada, Ltd., *637 Parkdale Avenue N., Hamilton, Ontario.*

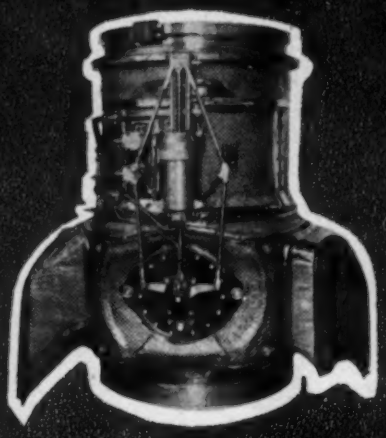
EARLIER this year, this company (which is controlled by Sir Oliver Simmonds) transferred its complete operations from Montreal to Hamilton, where it now occupies a building of 10,000 sq ft. The company continues to serve the Canadian aircraft industry with the supply and servicing of proprietary aircraft accessories, such as fuel gauging equipment used in T.C.A. aircraft and also specified by de Havilland of Canada for the DHC.4 Caribou. Simmonds Aerocessories of Canada, Ltd., are exclusive

Successful heat exchange and heat insulation

Success in our business doesn't merely mean the ability to manufacture, though we are extremely well equipped, even to the extent of having our own aluminium flux bath brazing plant.

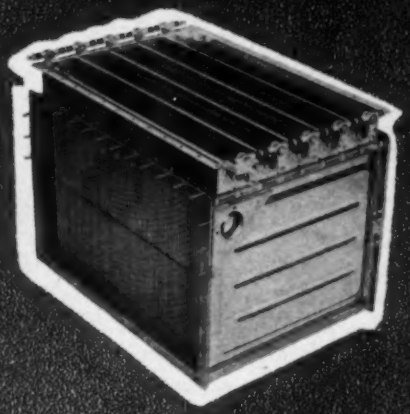
Success to us, means the ability to solve problems; to produce something that will do a new job, or perhaps an old job in never-before-experienced circumstances. And then, of course, to make it a practical and economical proposition.

We have forty years experience and wide resources. If we can help you in any way with heat exchange and insulation equipment, please contact us. We are always at your service.



1

These thermal blankets are made of refractory fibre cased in .004 inch (.1016 mm) stainless steel. They are made-to-measure and are extremely light, the dimpled construction being responsible for their great strength. Specified for Rolls-Royce and Armstrong Siddeley jet and turbo-prop engines, these particular examples are shown fitted to the Rolls-Royce thrust reverser for the de Havilland Comet and Sud-Aviation Caravelle.



2

We design, manufacture and supply heat exchangers for many purposes in both aluminium alloy and stainless steel. This particular example is for the Vickers Vanguard's anti-icing system. Similar units are being supplied for the Fokker Friendship, the Bristol Britannia, the Armstrong Whitworth Freightliner and the Vickers Viscount.

3

High pressure fuel-cooled oil cooler for high performance gas turbine engines. This unit is used in the Armstrong Siddeley Sapphire S.A.7.

We have now introduced Sealed Thermal Insulation Blankets for Civil Aircraft

Delaney Gallay LTD

Vulcan Works, Edgware Rd., London, N.W.2. Tel: GLAdstone 2201

this nose sees...

Housed in the centre-body of its engine air-intake the English Electric P1B will carry one of the most advanced airborne interception radars in the world. This search-and-track radar forms part of AIRPASS, a complete fire-control system designed, developed, tested, and manufactured by Ferranti Ltd., Edinburgh.

AIRPASS also includes an approach computer and an attack sight. With their aid the pilot can quickly and easily manoeuvre into an attack position, aim his weapons and destroy the target, even though he may never see it. If the target should come into view he can continue the attack visually without adjustment of the sight.

At present in production for the P1B, AIRPASS is small enough to be fitted in most military aircraft including lightweight fighters. A complete after-sales service is available, including field engineers, training courses, manuals, test gear, spares, etc.

AIRPASS

A FERRANTI RADAR FIRE CONTROL SYSTEM

Airborne Interception Radar and Pilot's Attack Sight System.

- ★ Long-range search-and-track radar.
- ★ Automatic approach and attack computing.
- ★ Blind or visual interception and attack.
- ★ Full freedom of control by the pilot at all times.
- ★ Packaged design for weight-saving and ease of servicing.
- ★ Installation possible in lightweight fighters.
- ★ Simple, reliable operation.

FERRANTI LTD • FERRY ROAD • EDINBURGH 5 • SCOTLAND

The Canadian Industry...

Canadian representative for Saunders Valve Company, Ltd. (Aero Valves), King Aircraft Corporation, and several American manufacturers including Simmonds Aerocessories, Inc., and Dage Electric Company, Inc. Plans are in hand gradually to expand services and repair facilities, with the eventual aim of component manufacture.

Spartan Air Services, Ltd., *74 Sparks Street, Ottawa, 4.*

SPARTAN, the only major air-survey company to be wholly Canadian-owned, reports increased helicopter activity, the addition of new airborne survey instruments and an increase in foreign work as its major developments during the past twelve months. On the helicopter side, the company is now operating the Great Whale and Knob Lake bases of the eastern section of the Mid-Canada Line, in addition to the largest civil-licensed fleet of Vertol helicopters (six Vertol 42As and four Vertol 44As) in support of the defence line. The company also operates 24 Bell helicopters (Model 47 series D1, G, G2 and J).

The most spectacular fixed-wing operation is the high-level photography of some 200,000 square miles of Arctic islands to within 450 miles of the North Pole. This work, for the Canadian Government, has now started and will be spread over a maximum of five years. Five of Spartan's seven Mosquito 35s are being used.

In Shoran-controlled photography, Spartan has started on the last planned portion (Baffin Island) of the commercial Shoran-control mapping programme carried out for the Canadian Government since 1952. The aircraft being used for this work now are Super DC-3s equipped with R-1830-94 engines.

In instrumentation, the company recently announced the application of the nuclear precession magnetometer with tape-punching recorder to airborne geophysical surveys for minerals and oil-bearing bodies. This new instrument will replace the older type Gulf magnetometer previously used. The year also saw the successful testing of Canadian-developed Marconi Doppler radar equipment to aerial survey purposes, as well as the modification of Canadian-developed airborne profile recording equipment.

Abroad, successful utilization was obtained with one of the company's Cessna 310s equipped for medium-level vertical photography. This was used in the Bahamas, British West Indies, British Guiana and Colombia. In addition, extensive high-level vertical photography was carried out in the Dominican Republic, Colombia and Kenya.

Final delivery was made during the year of Colombo Plan natural-resources survey reports to India and Malaya. These were based on airborne geophysical surveys carried out previously.

On the organization side, the company's interest in Canadian Aero Service, Ltd., of Ottawa, has been sold back to Canadian Aero's parent company, Aero Service Corporation of Philadelphia. Company planning resulted in further diversification with the expansion of the resources engineering division to include a full-scale mapping establishment as well as more photo-interpretation specialists. Two new subsidiaries were formed: Spartan Air Services (Eastern), Ltd., operating six aircraft on aerial survey, spray, charter and helicopter service from Nairobi, Kenya; and Spartan Air Services (Quebec), Ltd.

Spartan bases are at Ottawa, Calgary, Edmonton and Nairobi. Offices are at all of the above points and also in London (England), Los Angeles, Vancouver, Toronto, Montreal and Quebec City.

Equipment owned or operated includes: (helicopters) ten Bell 47Ds, four Bell 47Gs, seven Bell 47G2s, three Bell 47Js, six Vertol 42As, and three Vertol 44As; (fixed-wing aircraft) one DC-3, one C-47, one Piper Cub, seven Mosquito 35s, two Cessna 310s, seven Anson 5s, one Lancaster, one Miles Gemini, one Piper Apache, one Stearman, one Taylorcraft Topper, one Airspeed Oxford and one Auster.

Sperry Gyroscope Co. of Canada, Ltd., *P.O. Box 710, Montreal.*

A NEW manufacturing programme on which Sperry Canada are now embarking is the production of a substantial number of APN-59 navigation radar systems for the CS2F Trackers of the R.C.N. Designed by the parent Sperry company of Great Neck, N.Y., to operate as a navigational and search radar, weather radar, or beacon interrogator, the APN-59 is a lightweight and versatile unit.

The Canadian Sperry company is also acting as a major sub-contractor to Canadair in the Sparrow 2 missile programme by manufacturing the autopilot section of the missile, together with ancillary functions such as automatic testing.

Another of the company's major manufacturing activities at present is a result of work done in the development engineering department. A production order has been obtained for the R.C.A.F. for low-drift LDG-1 gyros which, using the Rotorace principle, permit precise navigation in polar regions where magnetic references are unreliable. The order for instruments for the

Bell 47, one of Spartan's 32 helicopters, on northern supply work.

Canadair Sabre 6s for the Luftwaffe, mentioned in last year's Commonwealth issue, has been completed.

Sperry continues to place great emphasis on the activities of its development engineering department, whose personnel are engaged in the design and development of new concepts for navigational aids, flight data integrating, computing and transmission. One product of the department which is now in the prototype stage is a low-cost gyro stable platform. This is used as a three-axis inertial reference for aircraft navigation, replacing the conventional directional and vertical gyros together with gimbal-error correctors. Its gyros have an azimuth drift of less than one degree per hour as free gyros; the platform may be slaved to the Earth's magnetic field; and it is also capable of accepting external signals for Earth's rate and meridian convergency corrections.

Another development now undergoing final flight-testing is a modified version of the company's servo-diaphragm altimeter, an instrument which gives extremely sensitive and accurate altitude information. Other current projects include the application of digital computer techniques to air navigation and air traffic control problems; the development of cockpit instruments designed for the Arrow; and the development of an engine performance analyzer. Offshoots of the company's aviation work, which have been pursued with the aim of diversification, include the application of aircraft servo-controls to machine-tool control; and of aircraft techniques to the field of nuclear control (a computer has been designed, developed and built for Atomic Energy of Canada).

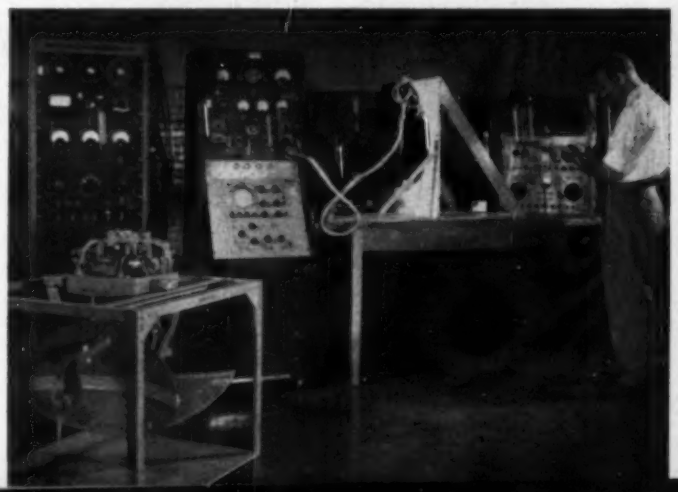
The activities of the head-office plant on Côte de Liesse Road, near Dorval Airport, Montreal, are supported by the overhaul facilities of branches at Ottawa and Vancouver.

Standard Aero Engine, Ltd., *P.O. Box 764, Winnipeg.*

NEW gas-turbine fuel-metering and test equipment has been installed at the Stevenson Field, Winnipeg, plant of Standard Aero Engine during the last twelve months. Plans for expanding gas-turbine facilities are being made, while the company's overhaul and maintenance work on a wide variety of piston engines continues.

The plant is also able to handle fuel, hydraulic, pneumatic and electrical accessories for both engines and airframes, plus wheels and brakes. Approximately 340 personnel are employed.

APN-59 radar undergoing test at Sperry Gyroscope's Montreal plant.



Air Transport in the Commonwealth

BY JOHN STROUD

HIGHLIGHTS OF THE YEAR: NEW ROUTES AND RE-EQUIPMENT

OUTSTANDING events in Commonwealth commercial air transport during the past year have been the Australian airline re-equipment decisions, the Wheatcroft inquiry into Canadian air transport, changes in West African operations, and the opening of new long-distance routes by East African Airways, Qantas Empire Airways and South African Airways. There has been a certain amount of re-equipment by Commonwealth airlines during the year, that of greatest importance being, in my view, the introduction of Viscounts by the Indian Airlines Corporation.

Aden. Services have been affected by the political situation, and Aden Airways no longer serve Cairo and Damascus. Difficulties regarding traffic rights have led to the suspension of services to Addis Ababa.

Australia. Although British aircraft have played their part in the development of Australian air transport—and, in fact, Qantas Empire Airways throughout its 36 years of operation has always included some de Havilland aircraft in its fleet—the products of the United States have long found favour with Australian operators. The DC-2 and DC-3 were adopted early in their lives and since that time the other Douglas transports have been introduced on domestic services, and in the post-war period Qantas has operated all its main services with Constellations and Super Constellations.

Trans-Australia Airlines, however, acquired a considerable fleet of Viscounts and these have given and are giving the airline excellent service. Butler Air Transport also bought Viscounts and, later, three secondhand Elizabethans. In small numbers Doves and Herons also found favour.

Since the war Australia has possessed three major airlines and several smaller concerns. The major carriers were Qantas Empire Airways, the State-owned international carrier; Australian National Airways, the biggest privately-owned domestic carrier; and Trans-Australia Airlines, the State-owned domestic airline.

One of the other airlines was Ansett, long established but well behind the others in size and importance. Nevertheless, Ansett had been steadily growing and had acquired a number of other operators. The climax came towards the end of 1957, when, after protracted negotiation, Ansett acquired Australian National Airways and with it control of Butler Air Transport and Queensland Airlines. The new concern was named Ansett-A.N.A. and is by far the biggest Australian private airline. At present Butler and Queensland still retain their identity.

The merging under one control of Ansett, A.N.A., Butler and Queensland gave the new airline an uneconomic assortment of aircraft and naturally one of the first problems was to take steps to reduce the number of types to a minimum. T.A.A.'s successful Viscount operation over routes where the two concerns are in competition made this type of aircraft almost essential for Ansett and an order has been placed for four V.832 aircraft for delivery early next year.

Vanguards, Electras, Comets, Caravelles, Friendships and Dart-Heralds have all been contenders for Australian markets, but it is the Electras and Friendships which have secured the orders.

Taking the smaller aircraft first, in Australia there was a need for a DC-3 replacement on many routes. T.A.A. had already decided on and ordered the Friendship. Queensland and A.N.A. several years ago had expressed interest in and their intention to buy Leonides-powered Heralds; this interest waned but as a result of talks with A.N.A. Handley Page decided to build a Dart-powered Herald. After the mergers Ansett had to choose between the Dart-Herald and the similarly powered Friendship; Ansett has now chosen the Friendship and placed an initial order for six.

The big shock to the British industry was the placing of the Electra orders. T.A.A. was interested in buying a few Caravelles for its main routes, but this idea was turned down by the Australian Government—thus causing, incidentally, much bad feeling. But at least in some cases it seems that the airlines were quite willing to buy Electras and let the Government take any criticism that was coming. Ansett-A.N.A., T.A.A. and Qantas have all ordered Electras. (Tasman Empire Airways has now entered into an Electra deal as well, but this will be commented on in the appropriate section.) Qantas has given some of its reasons for its choice. Delivery date for the Electra was more attractive than for any comparable aircraft thus, apart from other factors, making possible early release of some of the Super Constellations. Qantas did not say so, but the declining chances of selling used piston-engined aircraft would appear to be very much in their mind and Q.E.A. wants to be early in putting these aircraft on the market. Qantas has said nothing about the economics of the Electra but what has emerged is the fact that the airline has the maintenance contract for the Allison engines and for the propellers used by the Royal Australian Air Force's Lockheed C-130 Hercules military transports. It is not known whether Q.E.A. will also do some of the Electra and/or Allison maintenance for Ansett and T.A.A., but it is very likely that it will do it for Tasman. The R.A.A.F. contract means spreading the maintenance overheads. It was by no means a straight fight between Electra and Vanguard in Australia.

Other Australian events were the opening, in January, of a regular twice-weekly round-the-world service by Qantas. The airline had, of course, its well-established services to the United Kingdom via the east, and its trans-Pacific services. The link was completed by the opening of the San Francisco - New York - London sectors. This service is operated with Super Constellations but next summer Qantas will introduce Boeing 707s and will thus have the first all-jet round-the-world service. Also during the year Qantas acquired Fiji Airways and, in partnership with B.O.A.C., a 51 per cent interest in the reorganized Malayan Airways.

Tokyo Airport at night, seen from beneath the tail of a Super Constellation of Air-India International.

Bahamas. The tourist recession and the appearance of a newcomer have affected the growth of Bahamas Airways. B.A.L. now operate Herons on most routes while recently formed Skyways use a DC-3 and an L.10.

Bermuda. A completely new operation came into being this year with the opening of a Bermuda - New York service by a carrier based on Bermuda. This service is flown once daily in each direction by a Viscount and is operated by Eagle Airways (Bermuda), Ltd., which was set up as a subsidiary of Eagle Airways of Great Britain. This solitary Viscount, withdrawn once a fortnight for checks, is operating the route in competition with B.O.A.C., Eastern Air Lines as successor on the route to Colonial Airlines, and Pan American World Airways. Eagle's is a daring and enterprising venture, but additional equipment would appear to be extremely desirable.

Canada. On January 1 Trans-Canada Air Lines reduced its domestic tourist fares by 10 per cent and at the same time raised standard or first-class fares by 5 per cent, and later in the year

introduced a new service between London and Winnipeg and Vancouver. The airline also continued to increase its Viscount fleet.

Canadian Pacific Air Lines became the first Commonwealth airline to operate Britannias, and these aircraft are in regular operation between Vancouver and Amsterdam. The airline also extended, late last year, its Toronto - Lisbon route to Madrid.

Main event of the air transport year in Canada was the attempt by private airlines to extend their operations and to include transcontinental services within them—at present these are confined to the publicly owned Trans-Canada Air Lines. (See "Airline Competition in Canada," page 270.)

Central Africa. It has been a difficult year for C.A.A.C. A traffic shortfall (largely the result of low commodity prices) and delays in completing Bulawayo's new airport necessitated the charter of a Viscount to Kuwait Airways. Earlier this month a Viscount crashed at Benghazi while flying to London.

Ceylon. During the period under review Air Ceylon completed ten years of operation during which time its aircraft flew 8m miles. This year the airline's local DC-3 operations were handicapped by political troubles and, in the spring, by a patch of unserviceability. The long-distance services are still maintained by the single Constellation but there is a likelihood that it will be replaced or supplemented by a Super Constellation.

Cyprus. Although Cyprus Airways still exists—and is, in fact, still a member of I.A.T.A.—the company has disposed of its fleet, and under a new agreement B.E.A. has taken over the operation of the Cyprus Airways services, thus extending B.E.A.'s Viscount operations as far as Bahrein (although these are maintained under Cyprus Airways' flight numbers). Cyprus Airways had ordered two Viscounts for its own operations but they were never commissioned and Middle East Airlines acquired them.

East Africa. During the past year the East African Airways Corporation blossomed out from being simply a regional carrier to become a long-haul intercontinental carrier as well. A fleet of Canadair Argonauts was acquired from B.O.A.C., and tourist-class services have been opened between Nairobi and London and between Nairobi and Bombay via Aden and Karachi. For a number of years Air-India International had enjoyed a monopoly on this latter route.

A major event in East Africa was the long-awaited opening, on March 9, of Nairobi's new airport at Embakasi, close to the Game Park. This new airport has a 10,000ft runway and it makes possible, for the first time, the operation of all types of aircraft at present in service through that city. Previously the heavier or more demanding types had been able to come no nearer than Entebbe. The new airport has placed Kenya more securely on the airline map. Good as the new airport is, its height above sea level and the high temperatures experienced will necessitate runway extension to meet the demands of the coming generation of large jet aircraft.

In July E.A.A.C. transferred its DC-3 operations to Embakasi from Nairobi West, which in March had been renamed Wilson Airport. Now all scheduled operations to and from Nairobi use the new airport.

Gibraltar. Traffic across the Straits continues to grow rapidly, and Gibraltar Airways hope that relaxation of passport requirements will encourage further growth. DC-3s are used.

Hong Kong. Hong Kong Airways has continued to operate its Viscount services to Formosa, South Korea, Manila and Tokyo but still has not obtained rights for its desired operation into Okinawa. The acquisition of these rights is dependent on Northwest Airlines being given similar rights at Hong Kong.

Like the Australian companies, Cathay Pacific Airways (based on Hong Kong) has placed an order for Lockheed Electras. It is believed that Ansett-A.N.A. has a holding in Cathay Pacific, and this may not be unconnected with the choice of new equipment. The only route on which Hong Kong Airways and Cathay Pacific are in competition is that between Hong Kong and Manila.

India. The main Indian development has been concerned with the domestic operator, the Indian Airlines Corporation. This airline was born of an enforced merger of the various private Indian companies and its first years were indeed difficult from all points of view. Until recently its reputation was not of the highest, the accident-rate appearing to be unduly high. Two important changes took place towards the end of 1957, one being the appointment of a new general manager, A. Cdre. P. C. Lal, and the other the introduction of Viscounts.

Viscounts went into service in October on the Delhi - Calcutta - Rangoon route and have since taken over operation of most of the main routes linking the important cities, and they also link Bombay with Karachi and with Ceylon.

Traffic increased enormously on every route on which Viscounts had been introduced and the new aircraft and the increase in traffic has helped the morale of the staff. Ten Viscounts are now in use and there is a likelihood that more will have to be ordered.

A DC-6 of Tasman Empire Airways. Controversy was aroused this year over Tasman's re-equipment plans.

In its four years of existence I.A.C. traffic has doubled and the passenger figure for 1958 is expected to reach 650,000. Within another four years the corporation expects to be carrying a million passengers a year.

Freight traffic is good, and the airline is doing an enormous amount of freight lifting into and out of Assam. It is also engaged in supply-dropping in remote areas of Assam under very difficult conditions and it is on these operations that most of the accidents have occurred. In fairness to the corporation it should be pointed out that these supply-drops are made from very low level, without parachutes, in a mountainous area with poor and quick-changing weather—they are virtually military operations.

I.A.C. has already joined I.A.T.A. and will be joint host with Air-India International at the I.A.T.A. general assembly to be held at New Delhi in October.

Air-India International has opened its Delhi - Tashkent - Moscow service within the last few days. This had been delayed for some time as a result of difficulties in fuel-provisioning in the U.S.S.R. Super Constellations are being used and Aeroflot is flying a reciprocal service with Tu-104s.

There are strong indications that Air-India will open a North Atlantic service next year. Such a route will be needed to get the full utilization from the Boeing 707s now on order, and it is considered advisable to get route experience with the piston-engined aircraft.

With Air-India's own Boeing 707s on the way and various international operators set on using similar aircraft on routes across India, the question of suitable airports has been of considerable importance. The provision of these is a very real problem to India with its strained financial resources. First priority has been given to Santa Cruz Airport at Bombay, main base of Air-India. A completely new terminal building was brought into use earlier this year, and Burmah-Shell has provided a service station and ramp refuelling facilities. The present instrument runway is 8,200ft in length, and two hills on its most used approach enforce a 4 deg glide-path. Money has been allocated and work begun on the extension of the runway to 10,500ft and the extension is being made towards the hills, which will be cut down—a fantastic undertaking—to provide a glide-path of 2½ deg. Further extension to 12,000ft is under consideration.

Dum Dum Airport at Calcutta also needs longer and stronger runways but so far no money has been allocated for this essential work.

Malaya. At the beginning of the year Malayan Airways was completely re-organized. B.O.A.C. and Qantas Empire Airways now hold 51 per cent of the capital. The Singapore, Federation and Borneo Governments have holdings and there are other Malay and Borneo interests in the airline. B.O.A.C. and Qantas are represented on the Board and Mr. J. A. Vick, formerly of Cyprus Airways, is the new managing director. On March 1 the airline took over the operation of Federation Air Services and from that date a number of routes were withdrawn.

As part of the re-organization of Malayan Airways the Governments of North Borneo, Brunei and Sarawak set up Borneo Airways in which B.O.A.C. and Malayan Airways have a financial interest. Two Twin Pioneers have been delivered to Borneo Airways which also employs Dragon Rapides.

Malta. Viscounts have replaced Elizabethans on the services flown by B.E.A. on behalf of Malta Airways. The North African service now ends at Benghazi, not Cairo.

New Zealand. The New Zealand National Airways Corporation has now begun operation of Viscount services between Auckland and Christchurch and these are the first turbine powered commercial operations in the Dominion.

During the year considerable controversy arose over Tasman

A Super Constellation of Qantas Empire Airways, one of three Australian airlines to have ordered Lockheed Electras.

Argonaut R.M.A. "Astraea" of B.O.A.C., operating under the colours of West African Airways and flown by B.O.A.C. crews.

Air Transport in the Commonwealth . . .

Empire Airways' re-equipment programme, which was narrowed down to a battle between the Comet and the Electra.

Australia has a 50 per cent interest in T.E.A.L., and accusations have been made in New Zealand that Qantas "bulldozed" T.E.A.L. into buying Electras although the majority of T.E.A.L.'s directors were in favour of Comets. It is claimed that by chartering Electras to Qantas for some operations T.E.A.L. will, because of standardization with Australian equipment, obtain greater utilization than it could do with Comets. As far as I know it has not been disclosed whether T.E.A.L.'s Electras will be maintained by Qantas. It has also been suggested in New Zealand that by increasing the size of the total Australasian Electra order a more favourable price per unit was obtained.

Pakistan. There is little to report from Pakistan. Pakistan International Airlines, now operating two flights a week to Europe, has somewhat modified its routing to this continent, and added two more Super Constellations to its fleet.

A fleet of three Viscount V.815s will soon be in operation, and approval has recently been given for extension to Karachi Civil Airport to meet the requirements of large jet aircraft.

South Africa. Main news from South Africa this year has been the ordering by South African Airways of three Boeing 707-320s, and the opening by the airline of its service between Johannesburg and Perth. This route is via Mauritius and Cocos and its introduction was long delayed by a wrangle with Australia about the South African company's Australian terminal. Australia wanted S.A.A. to fly to Darwin, at which point its passengers were to be transferred to an Australian carrier. South Africa refused to consider this demand and insisted that Perth must be its terminal. This was finally agreed and the route is now operated on alternate weeks by South African Airways and Qantas. Qantas has the advantage of operating its service from Sydney via Melbourne and Perth, a facility which is denied South African Airways.

West Africa. Numerous changes in the air transport operations of the Commonwealth territories in West Africa have recently taken place, or will soon do so.

The Gold Coast's emergence into the sovereign state of Ghana brought about the ending of cabotage rights on the routes linking the United Kingdom and Accra. This has led to the creation of a new Ghana airline and to alterations in West African services of Airwork and Hunting-Clan Air Transport.

While cabotage rights obtained, Airwork and Hunting-Clan worked Safari coach-class services between London and Accra with Viking aircraft, making two night stops en route. With the creation of Ghana this service had to be withdrawn and the British independent airlines were granted rights for the operation of tourist-class services between the United Kingdom and Ghana. The new service was inaugurated on January 6 and Viscount aircraft are used. They make one night stop—at Las Palmas.

At the beginning of July Ghana Airways were incorporated to operate domestic, regional and international services. B.O.A.C. Associated Companies holds 40 per cent of the shares in Ghana Airways and the controlling interest is held by the Ghana Government.

B.O.A.C. and Ghana Airways have signed a seven-year pool agreement for the operation of services between Ghana and Britain, and a weekly Accra - London service was started by Ghana Airways on July 16. B.O.A.C. provides a Stratocruiser and the crew for this operation but the aircraft bears the new company's name and insignia and wears the Ghana flag. It is expected that Britannias will be used on this and the B.O.A.C. services to Ghana from next year.

On October 1 Ghana Airways are due to take over operation of the country's domestic services and also certain of the West African regional services.

This autumn West African Airways Corporation, which was formed by the four West African territories of Nigeria, Gold Coast, Sierra Leone and the Gambia and has its headquarters in Nigeria, will be re-organized as a company jointly owned by the Nigerian Government, B.O.A.C. and the Elder Dempster shipping group. In addition to operating domestic and regional services, the new company will work with B.O.A.C. on the trunk route to London. This route is at present operated by B.O.A.C. aircraft, with W.A.A.C. markings, and with B.O.A.C. crews.

It is also understood that the new Nigerian concern will continue to operate the internal services of Sierra Leone under contract to the Sierra Leone Government. Dragon Rapides operate the existing routes, which total about 275 miles.

West Indies. As with most Caribbean carriers, the recession has hit B.W.I.A. hard, although there has been an encouraging response to the extension of Viscount services throughout the region.

AIRLINE COMPETITION IN CANADA

(continued from page 271)

so that, in that year, if the percentage growths of traffic and aircraft size were applied to the 1957 figures, a transcontinental route Vancouver - Calgary - Regina - Winnipeg - Toronto - Montreal might reasonably be considered as having adequate potential to make unrestricted competition worth while. The report sums up this conclusion as follows:—

"The conclusion that the potential for airline competition in Canada is not likely to change from 1958 to 1961 but may materially change by 1966 is not altogether surprising when one considers the general trend of development anticipated in transport aircraft in the next ten years. The airline industry faces, with the introduction of the big long-haul jets like the DC-8 and Boeing 707 and the big short-medium haul turboprops like the Vanguard and the Electra, a revolutionary change in the size as well as the technical nature of its mainline equipment.

"Beyond 1961 it is to be anticipated (and sincerely hoped) that there will be a period of stabilization in the aircraft used. The major problem of introducing airline competition in Canada therefore appears to be that this change of policy is being contemplated at a time when it is very difficult for the industry to cope with this extra complication. In the mid 1960s, however, it ought to be possible to extend competition with much less concern about its adverse economic consequences."

The report then examines T.C.A.'s financial position and repeats that unless competition were strictly limited it would almost certainly lead to an overall deficit. T.C.A.'s route system was divided into profitable, potentially profitable and non-profitable (social) routes. This showed that any significant reduction in the profit of T.C.A.'s transcontinental routes would almost certainly cause an overall deficit. Discussing the social routes, which lost about $2.7 million in 1957, Wheatcroft makes out a strong case against "internal cross-subsidization," and states the arguments for Government subsidy of social routes:—

"A policy of direct subsidy would make possible a new approach to local and regional operations. Small carriers can almost certainly perform these at a lower cost than a major trunk-route airline. Hence T.C.A. might be relieved of some of its unprofitable social services if the Government agreed to subsidize local carriers on these routes. An additional consideration is that the present financial difficulties of most of the small airlines appear to make some assistance essential for their survival. A review of the overall policy towards local and regional air services is required urgently."

Finally, the report considers further aspects of competition, such as the possibility of strictly limited licensing of carriers on certain domestic routes in order to improve existing international services; the granting of licences to competing carriers to provide extra capacity at peak periods ("this kind of licence has worked successfully in the U.K."); and the possibility that the prohibition of non-scheduled operations over scheduled routes might be withdrawn.

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The Australian Industry

IT will surprise nobody in the aviation world, and particularly the British section of it, that the Australian aircraft industry is a problem-child. Not when the whole of the parent industry of the British Commonwealth is, with few exceptions, beset with problems could Australia claim any unique situation in this. At least some of its difficulties are peculiar to the country, however, and they are worth considering side by side with its achievements.

There will undoubtedly be many who will say that these difficulties are unimportant because the industry itself is of little consequence in the general British Commonwealth scheme of things. Whether those voices are raised in the United Kingdom or elsewhere overseas, looking outwards towards a rainbow-lit horizon of possible export orders—or in Australia, motivated by the hope of a lighter taxation bill, they will be wrong. As an essential backing to the defence of Australia and New Zealand, and thus of the whole South-east Asian area of Western diplomatic influence; and as a contributor to the vitality and corporate strength of the whole British Commonwealth of Nations, this Australian segment of the aircraft industry has a most important rôle to play.

There is certainly nothing wrong with its history. A lineage that dates back to Lawrence Hargrave gives it an enviable ancestry; a notable war record demonstrates its quality in emergency; production of the Canberra bomber, the development of the Avon Sabre fighter and the design, development and production of an already-long series of aircraft projects—of which the most outstanding recent example is the Jindivik pilotless jet target aircraft—illustrate up-to-date technical and productive capacity.

It has shown, time and again, that it has the Australian characteristics of initiative and adaptability; yes, and of improvization also. There is a good backing of research, too, in the Commonwealth Aeronautical Research Laboratories, the Weapons Research Establishment, and university and industrial laboratories. Some of the earliest work in the important field of metals and structural fatigue exemplifies this.

What, then, does it lack? The simplest answer is bound up in one word—the one that dominates any industry, anywhere—orders. That answer, of course, is too simple. Lack of orders is the result rather than the cause of the Australian industry's problem. That cause is a compound of the geographic and strategic situation, dependence on military orders in what is, as yet, a very limited market, and a lack of vital leadership.

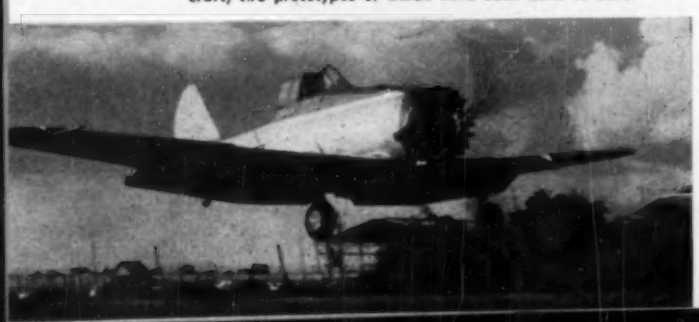
Geography is very largely Australia's shield. Strategic defence reviews have, until now, placed this continent in the favourable position that it is not immediately threatened should a major war develop, though military leaders label it indefensible should any direct attack be launched against it in force. That is why the Australian strategic defence plan is centred on Malaya, with the main threat considered as coming from Red China.

These facts take from Australian defence planning the atmosphere of national, local urgency such as that which Canada, for instance, feels in the direct line of fire between the United States and the U.S.S.R. The emergence of Indonesia, Soviet-influenced and in recent receipt of a first consignment of Soviet-built Mig-17s, is a new factor. That nation of 83 million people, with its strongly stated ambitions to absorb Dutch West New Guinea—which they call West Irian—lies athwart the direct communications line between Australia and Malaya. As yet, however, that possible future danger is too new and apparently unreal to affect the historic line of Australian defence thinking. It has not increased the sense of immediacy in defence-production planning.

The Australian aircraft industry came into strongly organized being twenty-two years ago because of the inability of the country to obtain suitable military aircraft from Britain, where the needs of the R.A.F. were then paramount. The need for local supply became even more pressing during the Pacific war, when for long periods neither Britain nor America could provide up-to-date weapons for an Australian ally fighting desperately for survival.

The rapidly developed Australian industry not only filled the gap in the provision of aircraft for the Royal Australian Air Force, but supplied a well-equipped and technically well-manned overhaul base for the American forces fighting in the South-west Pacific theatre.

The new Commonwealth Aircraft Corporation Ceres agricultural aircraft, two prototypes of which have been built to date.



In the postwar years the industry has been maintained but the market has contracted. Where could Australian-built military aircraft be marketed except in Australia? South-east Asia? Those countries that might have bought were, at least in some cases, regarded as bad security risks. Others were too poor or in happy receipt of American goodwill gifts or backing for their own local industries. New Zealand? With her strained economy the Dominion has so far found Australian prices too high; and, in any case, England has always been glad to supply her on specially favourable terms.

The R.N.Z.A.F. bought Goblin-powered Vampires from England, more than 12,000 miles away, when the Australian de Havilland factory was producing higher-performanced Nene Vampires at Sydney. More recently the R.N.Z.A.F. has been supplied—partially on lease—with U.K.-built Venoms and Canberras although Australia was building Avon Sabres and Canberras and, in any emergency, is the obvious supply base for spares and replacements for Australasian-based air forces.

The latest re-equipment plan for the R.N.Z.A.F., dated July 1957 (before the present Labour government was elected to office), called for the expenditure of £62,450,000 during a five-year period, and there were high hopes that the Australian industry would benefit. But, even before the U.K. Canberra deal was announced, the then acting N.Z. Minister of Defence, Mr. Eyre, had been quoted as saying ". . . consideration not only of economics but of major problems of standardization, delivery dates and spare parts availability limit the use that can be made of this (Australian) market."

Since then a New Zealand military mission has surveyed the Australian defence industry and some as yet unannounced orders have been placed, but it is believed that these cover items of army equipment—probably F.N. rifles, ammunition and the like—and there has been no suggestion yet that the Australian aircraft industry will have a share. The comparatively recent tumult in the Dominion over the purchase of Electras for Tasman Empire Airways, and the uninformed suggestions that Australia exerted unfair influence to achieve this result, have not improved the prospects of any public demand in New Zealand that the two Commonwealth neighbours should have closer links in defence supply planning. On the other hand, the present N.Z. Government, facing an economic crisis, has sought and obtained a measure of financial assistance from Australia.

Production Delays

Australian policy has been at least partially responsible for the existing failure to develop an export market in the countries of the South and South-west Pacific. Small orders, constant modifications, and indecision in extending or replacing existing programmes have resulted in frequent interruptions of the already-restricted rate of production. These factors, with others associated with government-furnished equipment, have put costs largely beyond the control of the industry. Nobody has ever stated what prices have been quoted to possible overseas buyers—but there can be little doubt that they have been much higher than they should be, judged commercially.

The R.A.A.F. itself has been a reluctant buyer in recent years. Not unnaturally it wants the backing of a highly skilled supply and overhaul facility as a defence background, but in peacetime it would like to spend its limited funds where it can get the best immediate bargain—with quick deliveries thrown in.

The annual Air Vote has been severely restricted within the now almost-standard £190,000,000 overall Australian defence budget, and as half the financial year is gone before it can call with certainty on this financial backing it is rarely able to spend even up to this limit.

"Why should we have to subsidize the local industry?" grumbles the R.A.A.F., or a strong section of it—forgetting, of course, that supply financial provision, even when restricted, is still based on supply circumstance.

The most consistent advocate of a strong Australian aircraft industry, Air Marshal Sir George Jones, who was C.A.S., R.A.A.F., during the second world war, has answered repeatedly with the claim that in any time of emergency Australia can never depend on getting first-line equipment from allies who have their own serious supply problems; and he has ample evidence to support this statement from wartime experience, when Australia had to convert a trainer, the NA-33 Wirraway, into a fighter to face Japanese Zeros.

In today's R.A.A.F. that experience, though not forgotten, is

The Australian Industry . . .

overlaid by more-recent problems of local supply. One of the claims now is that too high an obsolescence rate is built into locally constructed aircraft. From the time a licence is obtained for a fully productionized American or British aircraft it will be at least two years before the Australian production-line begins to flow, and then the rate is one or two a month. By the time the aircraft reaches squadron service it is likely to be in the "phase-out" stage in the country of its origin.

There are fallacies, of course in this line of argument. The industry calls it short-range thinking and itself points an accusing finger. The Air Force takes too long to make up its mind, it claims, and there is timidity in selecting an aircraft from drawing-board or prototype stage. It has to be fully proven before an order is placed, and then the quantity sought is too small for economic costing. Then the Air Force wants the initial batch in a hurry, which means building up to a peak of employment, with an inevitable later slump while the R.A.A.F. goes through the same tortuous process of selecting, deciding, ordering—or re-ordering. In between times the initial costing of the project is further upset by R.A.A.F. demands for modifications to be introduced on the production line.

Industry exponents argue, too, that the quoted costs of locally built aircraft, even in Parliament, are frequently exaggerated, while those of imported aircraft are under-estimated. There are no protective tariffs such as the automotive industry enjoys.

"If we are to be judged on a basis of comparison with overseas it can be stated quite definitely that local production costs are less than overseas for aircraft of American origin, providing the Government makes an early decision and the order is in the region of 100 aircraft," stated Mr. E. J. Jones, aircraft factory manager of Commonwealth Aircraft, in an address to the Aeronautical Division of the Institute of Engineers.

"This is due entirely to the fact that local labour costs are approximately 40 per cent of the U.S.A. costs. Engineering and tooling costs for this quantity can be absorbed and the price still be economical, for it is not those costs which make local costs high by comparison with the U.S.A. but the learning-curve effect brought about by the large numbers of aircraft ordered by the U.S. government. . . .

"We can no longer afford to adopt a wait-and-see policy; we must take a calculated risk and embark on the paperwork stage when the first of production of an appropriate aircraft, which will meet the specifications of the R.A.A.F., passes the initial tests."

In fact, the Australian industry has repeatedly demonstrated its ability to introduce design modifications which have offset obsolescence in the original design. A notable example is the Avon Sabre, a development of the North American F-86F to incorporate the RA.7 Avon engine and two 30 mm Aden guns and, later, extended leading-edges incorporating fuel cells. The Avon Sabre is acknowledged the best of its breed—and it is still a very useful fighter and army support aircraft for the Malayan theatre, though it is also acknowledged that the Mig-17 has "a slight edge" on it when both are handled by pilots of equivalent experience.

In any grumbles between the R.A.A.F. and the industry the truth of the matter is that both sides are subject to frustrations inseparable from the normal conflict between ambition and economics. This is particularly so in a country with the defence and general development problems of a huge continent, the prestige and responsibilities of a nation that takes a substantial place in international affairs, but which enjoys the taxation resources of less than ten million people; a nation, what is more, that attunes its general international policies to those of Whitehall, but accepts the United States as "big neighbour," principal ally and defence-equipment mentor.

The defence philosophy that Australian forces have a fire-brigade rôle in the South-east Asian area, and must be equipped accordingly, does not sit well with the fact that Woomera missile testing, emphasizing the effect of the Sandys Defence White Paper, rates fighters and medium bombers as almost anachronistic. To untutored thinking the quality of the fighter for its rôle does not seem so important against this background.

The ideal fighter for R.A.A.F. choice would have long range for delivery, a wide radius of action, short-field take-off and landing performance, supersonic speed, the abilities of an air-superiority intercepter at high altitude (without too-complex ground control), variety of armament to do a useful army co-operation job at low level, cheapness of construction and simplicity of maintenance. At the moment opinion shuttles between the Northrop N-156F and the North American A3J Vigilante, with occasional diversions in favour of the Grumman F11F and the Republic F-105.

The R.A.A.F. would also like a long-range bomber squadron, but has resigned itself to the political fact that this hope, which burned so bright when Air Marshal (now Air Chief Marshal) Sir Donald Hardman was Australian C.A.S., has flickered out . . . at least for the time being.

Another complication of the re-equipment picture, as it affects both the R.A.A.F. and the aircraft industry, is the fact that the Australian forces are committed not merely in a home-defence rôle, but to SEATO, and hence they must equip for a rôle that is not necessarily of their own choosing. Three years ago it was the "air superiority" rôle in Malaya. It was for this that an R.A.A.F. re-equipment mission, after an overseas tour, selected the Lockheed F-104. Then there were rumours of a change of rôle and, after a further mission, led this time by the Minister for Defence, Sir Philip McBride, the F-104 project was dropped and, pending a decision still to be made, a further Avon Sabre order was placed with the Commonwealth Aircraft Corporation—which had already ceased detail construction of that aircraft.

The Ruestow Mission

One result of the McBride Mission was the arrival in Australia late last year of an American technical mission, headed by Maj-Gen. Paul E. Ruestow, U.S.A.F., and including technical officers of all U.S. Services. This mission made an extensive and detailed study of Australian defence-industry potential and unconfirmed rumours were current that the outcome might be off-shore orders for the various sections of the Australian industry for supply to SEATO countries.

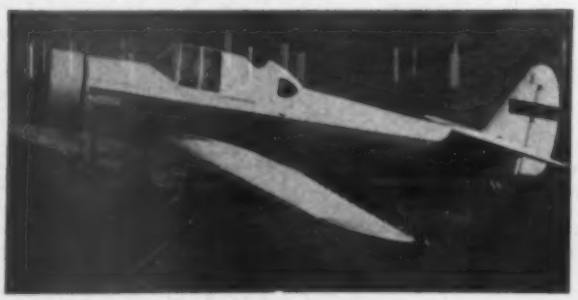
The rumours have been revived again in the past few months. In July Sir Philip McBride stated that the report of the Ruestow mission had "been the subject of conversations between the U.S. Secretary for Defense, Mr. Neil McElroy, and the Australian Ambassador to the United States, Mr. Howard Beale," and that Service officers of the two countries, U.S. Defense and State Department officials, were considering the report in detail. The U.S. Navy had been assigned authority to co-ordinate the recommendations of the three U.S. military departments.

All this sounded most promising but for the rest Sir Philip was designedly vague. He referred in general terms to the intention to re-equip Australian forces, particularly ground and air, with certain important items of U.S. pattern, and to proposals aimed at increasing standardization; but made only one definite statement directly affecting defence production. "A major effort is intended in the field of research and development to provide Australia with current information from U.S. Armed Forces research so that Australian resources and production efforts may be expended on the most promising new developments," he said.

If all this adds up to good news for the aircraft industry of Australia in the form of solid contracts it will be most welcome. The industry badly needs some dramatic change of fortune to give economic life to its magnificent tooling and fresh incentive to its technical staff.

The only major aircraft firm with a solid production programme at present is **de Havilland Aircraft Pty., Ltd.** (*P.O. Box 30, Bankstown, New South Wales*), working to an order for 68 Vampire Mk 35 two-seat trainers, mainly for the R.A.A.F., but including a few for the Royal Australian Navy. To date 21 of

Cropmaster agricultural aircraft produced by Kingsford Smith Aviation Service of Bankstown, New South Wales.



Handing-over of first Mk 35 Vampire Trainer by de Havilland to the Royal Australian Air Force.

these aircraft have been delivered by this company which, in the war years, produced 1,070 Tiger Moths, 87 Dragons, and 209 Mosquitos, and since then 80 Vampire fighters, powered with C.A.C.-built Rolls-Royce Nenes. The current production line has two years' work ahead of it, but it is not known what will follow the Vampire Trainer.

Service department facilities for the overhaul, repair and maintenance of civil and military aircraft and jet and piston engines have been considerably expanded and all sections have been kept fully occupied during the year. For the R.A.A.F., major servicing has been modification and overhaul, including the installation of Martin-Baker ejector seats, of Vampire fighter and trainer aircraft; and the overhaul of Goblin engines. Work carried out for the R.A.N. has included the overhaul of carrier-based Sea Venom aircraft and their Ghost engines.

Sales activity has been stepped up, particularly with Canadian D.H. Beavers and Otters. Following the recent link of the parent firm with Hunting Aircraft and Saunders-Roe, the Australian D.H. company has become the agent for the Jet Provost and Pembroke and, of course, the Skeeter. It undoubtedly hopes that sooner or later the R.A.A.F. will see fit to order the basic jet trainer, and that the Army may be interested in the Skeeter, both of which could be built under licence at Bankstown. A de Havilland office has now been opened in Melbourne in order to increase the company's sales representation in this area.

The propeller division at Alexandria has continued to function well during the year, being primarily concerned with the overhaul and repair of propellers for the R.A.A.F., R.A.N. and civil airlines. De Havilland Propellers guided missile development at Salisbury and testing at Woomera is proceeding as programmed.

Total floorspace available at the Bankstown factory is 275,000 sq ft and current employment figures are 1,120 at Bankstown, 200 at Alexandria and 100 at Salisbury.

The **Government Aircraft Factories** (*Department of Defence Production, Lorimer Street, Fishermen's Bend, Melbourne*) has completed the R.A.A.F. order for 48 Canberras, and is now working on a retrospective modification programme concerning these (a number are being converted to the trainer rôle). There is as yet no suggestion of a replacement programme for this big factory which, since its inauguration during the war years, has turned out 700 Beauforts, 364 Beaufighters, and 73 Lincolns as well as the Canberras. Its major hope is centred in the Jindivik pilotless jet target aircraft, which it designed and developed through the original manned Pika stage to the current version, which is performing magnificently at Woomera.

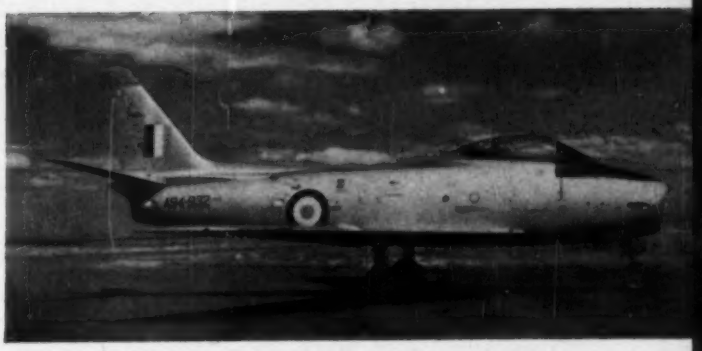
The Jindivik in use at present is the Mk 2 version. Mks 2A, 2B and 3 are under current development for immediate production. Of these, the 2A will retain the ASV.3 engine but will incorporate extended wingtips, pilot intake and improved cameras, and will have an operational ceiling of about 52,000ft. The 2B is similar, but is powered by the ASV.8 engine. The Mk 3, powered by the ASV.11, would be operational to not less than 60,000ft.

Studies are concurrently in hand for a Mk 4 version with a rocket motor, plus new wings and empennage. The aircraft in mind would be capable of operating at 70,000ft. Other investigations at present are directed towards the zero launching of Jindivik.

The Government Factories are working to combined Australian and British Ministry of Supply orders for about 114 of these rugged, medium-to-high altitude Viper-powered aircraft, though this order is nearly complete. Export orders have also been completed this year for the supply of ten to Sweden, and an initial order for ten from the British Government has just been increased by an additional 50 (not included in the above total).

Nothing has yet come of the earlier high hopes for U.S. orders, though "interest" is still reported from that quarter and from Canada, and West Germany is also still regarded as a possible customer. Another extension of orders for Woomera supply is also expected. If this wider market develops the Jindivik production line may prove a "saver" for G.A.F. pending a later decision, possibly including missiles in the broader military field. Rounds of the anti-tank Malkara missile have been produced during the year, 30 of which have been sent to the U.K., with 130 more on order.

Mr. I. B. Fleming, who, as the Government Aircraft Factories' chief designer, was responsible for Jindivik design and development, has now been appointed General Manager, Aircraft and Guided Weapons Supply, in the Department of Supply, with which the Department of Defence Production has this year been merged. In this he succeeded Mr. M. B. Woodfull, who had the title of General Manager, Aircraft Production. The broader title may later be shown to have some significance, but the present main interest is in Fleming's transfer from the head of the G.A.F. design team to an administrative job. There is a similar note in the resignation of Mr. D. G. Humphries as chief designer of Commonwealth Aircraft Corporation. He has joined de Havilland Propellers in England, to work under his former C.A.C. chief engineer, Mr. T. W. Air, who is design manager of the Blue Streak LRBM project. The work of these two designers has been taken over by other engineers but in neither case has a chief designer been appointed, a fact which carries its own comment.



Avon Sabre produced by Commonwealth Aircraft Corporation Pty., Ltd.

Commonwealth Aircraft Corporation Pty., Ltd. (*P.O. Box 779H, Elizabeth Street, Melbourne*), celebrated its 21st anniversary on October 17 last, with a remarkable record of original design, development and production behind it, in both aircraft and engine fields. This company, also, is still poised on the brink of uncertainty about future military projects, though it still has the 1957 promise that it will build the new fighter—when the R.A.A.F. decides on one. In the meantime it has completed the 90 Avon Sabres previously ordered, and its fighter production line is empty. Detailed manufacture is being re-instituted for the new batch of 21 (complete with up-to-date armament and other equipment) ordered as a stop-gap after the Government decided last year not to go ahead with the F-104 project. It has also completed orders placed for 62 CA-22 Winjeel basic trainers.

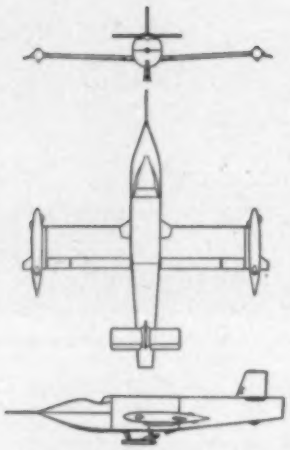
Bus bodies for General Motors and a line of aviation firetenders on sub-contract from Wormald's for the Department of Civil Aviation, the R.A.A.F. and R.A.N., are occupying some sections of this beautifully equipped and mass-production organized factory, while the main aviation interest is centred in the preparations for production of the Ceres agricultural aircraft, designed and developed on the basis of the earlier Wirraway trainer.

The C.A.C. engine factory, to which last year was added a third, well-designed test-cell capable of handling engines up to 30,000 lb thrust (in preparation for the F-104 project) at present has work to occupy it for eighteen months, apart from the provision of spares and its overhaul contracts for the R.A.A.F. Production is to orders for 120 RA.7s for the Sabres and 47 Avon 109s for Canberras (22 of the 109 series were also imported from England at the start). Originally the Sabres were powered with the Mk 20 Avon but the later ones incorporated the Mk 26, and the main job of the engine division is the re-matching modification of the earlier Mk 20s to give them the better handling characteristics of the later engine development. The big subsidiary factory at Lidcombe, N.S.W., which earlier produced 870 twin-row Pratt and Whitney Wasps and 108 Rolls-Royce Merlin Mk 120s, is now restricted to the production of spares and overhaul work for the R.A.A.F. and R.A.N. and civil customers and also the overhaul of Meteor tank engines for the Army.

[As this article goes to press, it is reported from Australia that the Lidcombe engine factory, which C.A.C. had operated as an annexe to the engine division of the Government Aircraft Factories, has been taken over by de Havilland Aircraft Pty., who will concentrate propeller and engine servicing activities there.]

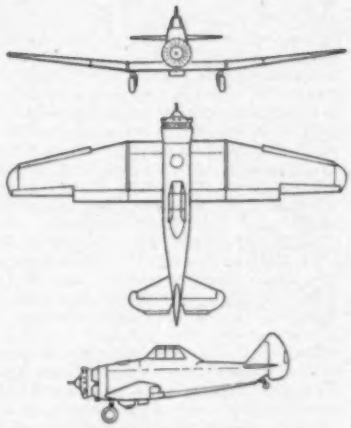
The decision of the C.A.C. Board to set up a production line for the Ceres, without waiting for initial orders, established two notable landmarks in the history of the company. It is the first private venture of the company taken to the production stage, and it is also the first time the company has set itself in serious pursuit of an export market—with New Zealand as the starting point. It is a departure from the tradition of Service aircraft built hitherto; and for the first time the company has appointed a technical sales representative, Mr. H. G. Richardson, formerly inspector-in-charge of the final-assembly flight and experimental section of C.A.C.

C.A.C. has fixed the initial Ceres line at 40. The selling price will be £A14,000, with terms possible through a bank agency. Two prototypes have already been built, and the third will be completed in March. By October next year the production rate will be one Ceres every two weeks. The aircraft, a low-wing monoplane able to carry more than 2,000 lb of superphosphate or 250 gal of insecticide, is expressly designed to meet the needs of Australian agricultural operators. Powered by a 600 h.p. Pratt and



D.A.P. Jindivik 2: Powerplant, A.S. Viper; span, 21ft; length, 23ft 3½in.

CA-27 Avon Sabre: Powerplant, C.A.C.-built Avon 20; span, 37ft 1in; length, 37ft 6in; gross weight, 17,000 lb; max. speed, 700 m.p.h.



CA-28 Ceres: Powerplant, P. and W. Wasp; span 46ft 11in; length, 30ft 8½in; gross weight, 6,640 lb; cruising speed, 100 m.p.h.

Whitney Wasp engine, modified with direct drive to a Hamilton three-bladed propeller, it is reported to have excellent handling qualities, a stalling speed of 47 kt E.A.S., and no wing-dropping tendency at the stall. The company has given assurance that there will be ample stocks of spares and good after-sales service, so it has every reason to expect a satisfactory response from the operators.

Commonwealth Aircraft Corporation was originally founded by a group of big business interests more as a service to the nation than for commercial purposes. Indicative of this is the fact that during the war, when the financial turnover was £7,000,000 a year, no dividends were taken by the shareholders. Some of these companies have by now dropped out and the issued capital, £A1,399,998, is now distributed among Broken Hill Pty. Co., Ltd. (466,666), ICIANZ (210,000), Broken Hill Associated Smelters (175,000), Broken Hill South (175,000), Rolls-Royce, Ltd. (140,000), Electrolytic Zinc Industries (116,666) and Orient Steam Navigation Co., Ltd. (116,666).

With this capital backing, a successful private venture could well lead to much more venturesome policies than have been followed in the past, when C.A.C. has been thought of almost entirely as a defence facility.

In the light-aircraft field de Havilland now have a project for a 4-5 seat private-owner type, though they have not yet released any details. A Queensland firm, Southern Cross Aviation, which has substantial industrial backing, has a similar project in train. Both of these are planned to win a share of the market which is now going substantially to American firms, particularly Cessna.

Several smaller firms had earlier ventured into the private and club owner or agricultural fields. Mr. Luigi Pellerini was responsible for the design of three of these—the Fawcett 120, the PL-7 Tanker, and the PL-9.

The Fawcett 120 offered by **Fawcett Aviation** (*Bankstown, N.S.W.*) was subjected to flight trials by an Army evaluation team in May last year, as a possible A.O.P. aircraft, and the Army men claimed it had performed very well and showed considerable promise. In the meantime the company has battled to obtain D.C.A. airworthiness approval, so far without much progress. The announcement in August that the Army, through the R.A.A.F., had ordered an initial eight Cessna 180s, with a prospect of 30 in the next three years, seemed to write *finis* to any major commercial prospect for that aircraft.

The PL-7 Tanker, experiencing C. of A. difficulties, has gained no ground for the efforts of **Kingsford Smith Aviation Service Pty., Ltd.** (*P.O. Box 11, Bankstown, N.S.W.*), to break into the agricultural field with a most interesting aeroplane. In the meantime the prototype has been destroyed in a hangar fire, with little hope of replacement.

The PL-9, a four-seat, fully aerobatic, low-wing monoplane, designed to be powered by a 150 h.p. Lycoming O-360 engine, was sponsored by the Royal Queensland Aero Club as a trainer, private-owner or charter aircraft. The project, however, has not proceeded beyond the drawing-board stage.

In nearly all these cases there have been complaints of unnecessary delays and over-meticulous fault-finding by airworthiness authorities, and also that type approval tests have been passed over by D.C.A. to the R.A.A.F. Aircraft Research and Development Unit to perform.

The most recent aircraft to be designed and built by the Kingsford Smith company is the KS.3 Cropmaster, a low-wing agricultural machine capable of carrying 8 cwt of solid or 80 gallons of liquid. Powered by a 170 h.p. Warner Super Scarab engine, the Cropmaster has a gross weight of 3,000 lb, a wing area including high-lift flaps of 190 sq ft, and an operating speed of 85 kt.

There is already a very useful backing of sub-contractual and ancillary manufacture and of overhaul facilities in the industry, and a steadily developing supply source of Australian materials, but these are at present affected by the problems of the major industry. There is not sufficient incentive in the small orders that are available—and in their constant fluctuation—to encourage supply backing from local industry for the special needs of the aircraft manufacturers. Some firms which have set up facilities (such as Fairey at Salisbury, South Australia) have found their market restricted by parallel production in government establishments.

The location of the Weapons Research Establishment, Salisbury, and the big missile testing centre at Woomera must inevitably, in time, bring a deep interest in missile development to the Australian industry even if it has not, as yet, encouraged the setting-up by British missile firms of more than testing units in the Commonwealth. That development, it seems, is for the future. There is, however, speculative interest in the fact that D.H. Propellers' Australian subsidiary has recently been advertising extensively for technical staff.

KENNETH GREEN.

ANCILLARY COMPANIES

Amalgamated Wireless (Australasia), Ltd., *47 York Street, Sydney, N.S.W.*

THIS company's research laboratory at Ashfield, N.S.W., is the only such private-enterprise laboratory to hold a licence from the National Association of Testing Authorities to test and report on radio components to British Services Standards.

A.W.A. manufacturing activities occupy over 1,000,000 sq ft of floorspace and produce a wide range of components such as valves, transistors, speakers, condensers, switches and allied parts for use in radio-communication equipment for aircraft and a wide range of other applications.

The company also maintains installations in ships and is radio servicing contractor to all Australian airlines, in addition to servicing radio equipment in aircraft of commercial airlines from abroad. A.W.A. is also closely associated with the nation's defence services in the supply and maintenance of radio equipment for communication purposes. A branch office of the company is located in London.

Bristol Aeroplane Company (Australia) Pty., Ltd., *Short Street, Bankstown, N.S.W.*

BRISTOL activities in Australia are centred at Bankstown near Sydney in New South Wales, Melbourne in Victoria and Salisbury and Woomera in South Australia. Bankstown is the company headquarters and also the home of Bristol Aviation Services Pty., Ltd., a wholly owned subsidiary company responsible

for the overhaul and repair of aircraft, engines and ancillary components.

Airframe and helicopter overhauls, repair, maintenance and assembly of new aircraft are products of the B.A.S. hangars at Bankstown Aerodrome, while component parts and engines, ranging from the smallest light-aircraft power units to the Centaurus used in Ambassador aircraft of Butler Air Transport, are all overhauled and serviced in the modern engine shops situated at Short Street (a few miles from the airfield and adjacent to the company's administrative block).

Apart from routine overhaul and inspection of Freighters, Sycamore helicopters and other Bristol products for the Australian Services and civil operators, provision is made for the overhaul of many types of non-Bristol aircraft and engines. In fact, R.A.F. Dakotas based with the task force operating at Christmas Island are now being flown to Australia for major overhauls by the company. Additional Bristol services provided from Bankstown are aircraft salvage operations throughout Australia and New Guinea, and technical assistance to B.O.A.C. in connection with their Britannias flying the Kangaroo route.

For the future, increased facilities will be made available to operators of light aircraft and, in this connection, arrangements are well in hand for overhaul and spares provisioning of Continental engines. It is also anticipated that expansion of the engine workshops will take place to cater for increased work resulting from the recent Bristol-Siddeley amalgamation.

Security regulations allow only brief mention of the Bristol weapons division situated on Weapons Research Establishment premises at Salisbury and Woomera, but it may be said that the research and development on the Bristol/Ferranti Bloodhound is an important function of this unit, which works in close harmony with teams from Aberporth and the parent company in the United Kingdom.

Bristol's Melbourne office is responsible for the Australian sales organization and military liaison in relation to the entire Bristol group of companies. It also represents the interests of several other manufacturers in the U.K. and U.S.A. under agency arrangements.

Chrysler Australia, Ltd., *Aircraft Division, Finsbury, South Australia.*

THE aircraft plant of Chrysler Australia, Ltd., occupies in Australia the position of major sub-contractor to the Commonwealth Government on all aircraft projects allocated to the Government Aircraft Factories. It also operates as a sub-contractor to Commonwealth Aircraft Corporation Pty., Ltd., and offers similar facilities to British aircraft companies with branches in Australia.

In addition to these activities, large orders have been completed for the Department of Supply in connection with missile carriers and containers, and projects are also undertaken for the Weapons Research Establishment situated at Salisbury, South Australia.

Chrysler are at present actively engaged in producing additional orders for Jindivik target aircraft components to the latest mark design and have a potential for producing this particular aircraft on a high-volume basis. At the same time, spares and modification kits are being produced for Australian-built Canberra bombers, all of which are now in commission, enabling them to be maintained in the desired Service condition.

Recently the company has extended its activities in the field of plastics. The plastics production department is specializing in Fibreglass reinforced polyester and epoxy resin products, and one of their recent achievements has been to design, engineer and produce plastic wing-tip drop-tanks to specifications laid down by the Department of Supply.

These drop-tanks, with a capacity of 100 gallons, were especially designed for Australian conditions and are constructed entirely from glass-reinforced polyester utilizing the pressure-moulding technique. The company's plastics department is also engaged in the manufacture of plastic components for the Jindivik aircraft, also epoxy resin base tools and polyester base articles for commercial use. Operations in plastics are backed by a strong laboratory, engineering and inspection team, thus ensuring close control of formulations and quality of product.

Dunlop Rubber Australia, Ltd., *Mountain Highway, Bayswater, Victoria.*

ACTIVITIES during the past year have continued with the production of wheels and brakes for locally manufactured Vampires, Canberras and the trolley component of the Jindivik. The company has under development new wheels, brakes and brake-control system for this trolley, and is now producing pneumatic equipment for the aircraft itself. Certain guided-missile projects have also been included.

The company has maintained its wide range of flexible pipes for airframes and engines: these are fitted to the Canberra, Vampire, Sabre and Winjeel, in addition to other R.A.A.F. and civil aircraft. Overhaul services for the R.A.A.F., R.A.N. and civil operators have been expanded.

Manufacture of flexible tanks has continued, not only for aircraft fuel systems but also for the bulk transportation of liquids by air and on the ground. These activities were outlined on this occasion last year: since then more experience has been gained and the containers continue to give satisfactory service. During the year, the company completed a large flexible rubber hopper of four tons capacity to contain superphosphate in a crop-dusting Lodestar aircraft developed by Fairey Aviation of Australasia.

Lucas-Rotax (Australia) Pty., Ltd., *81 Bouverie Street, Carlton, Victoria.*

AT its modern premises close to the International Airport at Sydney, Lucas-Rotax (Australia) is now equipped to handle sales and service of components for aircraft powered by internal-combustion, turbojet, turboprop, by-pass flow and ramjet engines. A staff instruction school has recently been established at the Zetland headquarters and its facilities are extended to representatives of the Services and commercial airline operators.

The company carries the approval of the Australian Aeronautical Inspection Directorate and the Australian Department of Civil Aviation for the sale, manufacture, repair and overhaul of aircraft electrical, hydraulic and fuel system equipment. It is also an approved R.A.A.F. modification centre.

The fully equipped Lucas-Rotax laboratories and workshops are being kept busy as civilian contractors to the Royal Australian Navy, Army and Air Force and overhaul contractor for Lucas fuel-system units on Rolls-Royce Dart engines for Australian, New Zealand, Hong Kong and Philippine airlines.

Normalair (Australia) Pty., Ltd., *Essendon, Victoria.*

WITH its factory and offices at Essendon, this company continues to provide supporting services for Normalair equipment used in British aircraft operated in the Far East. It is equipped to undertake the servicing, repair and overhaul of such equipment, and advises on techniques and procedures in cases where an operator handles his own servicing and overhaul. The company also overhauls and repairs American pressurization equipment, and another activity is the servicing, repair and overhaul of equipment manufactured by British firms who have no representation in Australia.

Rolls-Royce of Australia Pty., Ltd., *78-86 Kent Road, Mascot, N.S.W.*

THE Rolls-Royce factory at Mascot continues to be engaged in the overhaul of Dart 506 and 510 engines operating in Viscount aircraft. In the near future, the work will be extended to cover the overhaul of the later Dart 511 and 525 engines which will be operating in Fokker Friendship and Viscount 810 aircraft early next year.

The overhaul life of Dart engines in Australia has now been established at 1,500 hr and trials are in hand to extend the life to 1,600 hr. It is anticipated that early next year the overhaul life will be in the region of 1,800 hr or more for Dart 506 and 510 engines.

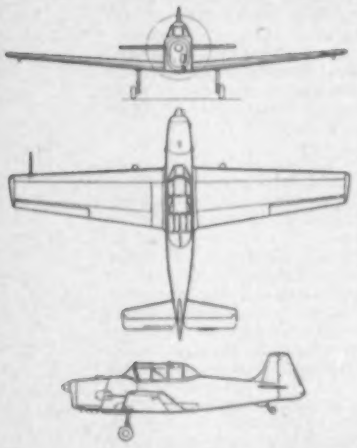
Full technical liaison is maintained with all operators of Rolls-Royce engines in Australia, New Zealand, Hong Kong and the Philippines, and assistance is being given in establishing operators' overhaul bases. A full range of spare parts is maintained to supply over-the-counter service to operators, and additional premises have been built during the last few months to accommodate larger stocks of spares in view of the increased number of engines which will shortly be operating.

The industrial-engine business is steadily growing and these engines are becoming increasingly established. Rolls-Royce industrial petrol engines are now operating in aerodrome crash tenders and the business potential in this direction is quite considerable. The company's instruction school is becoming increasingly popular with the advent of new operators using Viscount and Friendship aircraft.

Bloodhound inspection at the Bristol factory at the Weapons Research Establishment near Adelaide, South Australia.

Folland-built Gnat Mk 1 for the Indian Air Force.

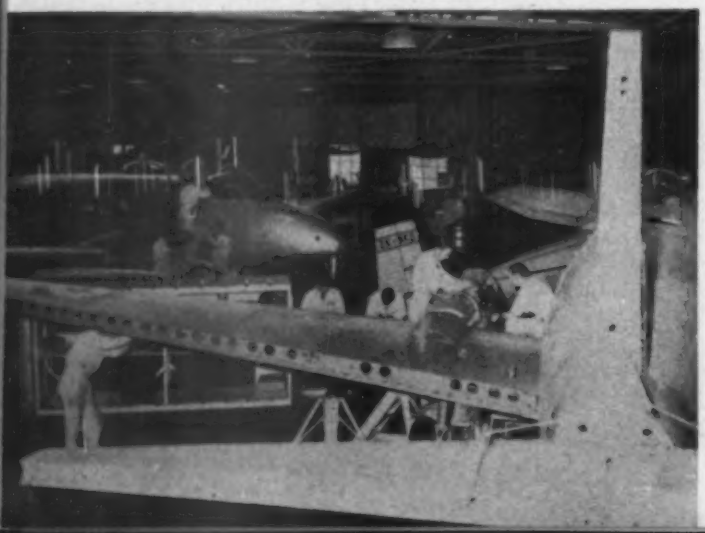
First Folland Gnat for India goes aboard an I.A.F. C-119 Packet.



Hindustan HT-2

Powerplant ...	... Cirrus Major 3
Span	... 35ft 2in
Length ...	... 25ft 3in
Gross weight ...	... 2,240 lb
Max. speed ...	... 130 m.p.h.

R.N.Z.A.F. Devons on major inspection by de Havilland at Rongotai. A new D.H. factory is now being built at this airport.



India

NEW factory buildings in which the Folland Gnat and its Orpheus turbojet will be licence-built by **Hindustan Aircraft (Private), Ltd.** are nearing completion at Bangalore. Preliminary work is already under way and production plans are being co-ordinated with the team of Bristol engineers now on deputation to the Indian company. It is expected that the first Indian-built Gnat and Orpheus will be completed by about 1961, i.e., within the country's second five-year-plan period.

In the meantime, Folland are sending to India 15 complete Gnats, and 25 in "knocked-down" condition for assembly by Hindustan Aircraft. Of these, three of the completed machines have been delivered and five of the assembly-kits are now *en route*. The first Hindustan kit-assembled Gnats should fly early next year.

Present production is mainly concentrated on the company's own HT-2 trainer, and fighter and trainer versions of the D.H. Vampire for the Indian Air Force. The next major programme will be that devoted to the Gnat, while work is already progressing on the development of an advanced jet trainer and a medium transport aircraft.

Overhaul work, which the company is planning eventually to concentrate at its Barrackpore facility, has continued this year at a somewhat lower level, both on aircraft and engines. The factory's total overhaul volume in the 12 years of its existence up to February of this year, however, is impressive: 2,600 engines, of which 2,500 were Pratt and Whitney R-1830-92s; and 430 aircraft of 15 types, of which Dakotas accounted for over 90 per cent. In addition, there have been 79 civil aircraft conversions for India and abroad.

On the research side, Hindustan Aircraft works in close collaboration with the aeronautical engineering department of the Indian Institute of Science, whose wind-tunnel and structural test facilities are available for company use. As reported in last year's Commonwealth issue, the company's design department has been strengthened by a team of aeronautical specialists from abroad led by Dr. Kurt Tank. Total employment at the H.A.L. factory is just under 12,000.

New Zealand

IN no other country has the value of agricultural aviation, per head of population, assumed such a predominance as it has in New Zealand. This basic fact has not changed, except for the continued increase in activity and the introduction on a small scale of new equipment, since our Commonwealth review of last year, but it remains a unique and significant foundation for the country's domestic-aviation scene.

New Zealand's aircraft industry consists simply of assembly, overhaul, maintenance and modification facilities, in addition to the various agency organizations for U.K. and U.S. aircraft firms and other companies abroad. The major assembly programme in recent years has been that of the Fletcher FU-24 agricultural aircraft, kits for which have been imported by the aviation division of **Cable-Price Corporation, Ltd.** (*166 The Terrace, Wellington*) and assembled by **James Aviation, Ltd.** (*Rukuhia Aerodrome, Hamilton*).

Of over 300 aircraft operated by 70 New Zealand companies on agricultural work, notably aerial top-dressing of hillside pastureland, the majority are still D.H.82 Tiger Moths. Fletchers, Pipers, Cessnas and Austers are also popular. The Edgar Percival EP.9 and the Auster Agricola have also been introduced to New Zealand, and five Agricolas are in operation there at present. New Zealand will doubtless be taking a keen interest in the two new Australian agricultural aircraft.

Among the aircraft maintenance firms, the **de Havilland Aircraft Company of New Zealand, Ltd.** (*Rongotai Aerodrome, Wellington, E.4*) continues to provide service, maintenance and overhaul facilities for the R.N.Z.A.F., agricultural and commercial operators and flying clubs. Its existing premises are to become the temporary terminal for the new Rongotai Airport; and another factory is being built on the western side of the new runway there. This should be occupied by the end of this year.

Sales and technical representation of the U.K. Bristol companies are the functions of the **Bristol Aeroplane Company (New Zealand), Ltd.** (*113 Willis Street, Wellington, C.1.*). This firm also represents a number of other manufacturers, including Rotol, Shorts, Auster, Auto Diesels and Redifon.

While no plans have been announced for the local manufacture of any aircraft other than the assembly of the FU-24, at least one New Zealand company has recently taken an active interest in the possibility of licence-producing a British or U.S. light aircraft.

SERVICE AVIATION

Royal Air Forces and Naval Flying News

Air Marshal C. E. Chilton, A.O.C. Malta, taking the salute at R.A.F. Idris after presenting to the station a unit badge approved recently by the Queen. It was designed by S.A/C. R. Bellamy, a clerk in the Air Movements Section at R.A.F. Idris.

R.C.A.F Changes

NEXT month A.V-M. L. E. Wray, who has been A.O.C., R.C.A.F. Air Defence Command, since January 1955 takes over the post of A.O.C. the R.C.A.F.'s No. 1 Air Division in Europe. He succeeds A.V-M. H. B. Godwin, who is retiring from the R.C.A.F. after more than 30 years' service. The new A.O.C. Air Defence Command is A.V-M. W. R. MacBrien.

Sea Vixen Trials

A D.H. Sea Vixen trials flight is to be formed by the Royal Navy in the late autumn. This will be similar to 700X Trials Flight, based at R.N.A.S. Ford in Sussex, which was formed to work up the Vickers-Supermarine Scimitar before that aircraft went into F.A.A. squadron service.

Britannia Shield Contest

THE thirteenth annual competition for the Britannia Shield, which perpetuates the comradeship between allied nations during the Battle of Britain by a series of sports contests between them, will be held this year from October 27 to 29.

The contests will be at R.A.F. Uxbridge (fencing), Bisley (shooting), Watford (swimming), and R.A.F. Stanmore Park (boxing). All profits from the series go to the Britannia Shield Scholarship Fund administered by the R.A.F. Benevolent Fund.

Recent Postings

AMONG R.A.F. appointments recently announced by Air Ministry are the following:—

G/C.s A. A. Fletcher to the Ministry of Supply; M. W. B. Knight to R.A.F. Neatishead, to command.

W/C.s A. P. Dart to R.A.F. Ballykelly, for flying duties; J. S. Hando to No. 25 M.U., for administrative duties; K. C. C. Hicks to H.Q., 2nd T.A.F., for administrative staff duties; E. G. F. Hill to the R.A.F. Staff College, Bracknell, for directing staff duties; J. R. Ramshaw to R.A.F. Patrington; W. W. T. Ritchie to R.A.F. Watton, to command the Flying Wing; A. P. H. Slogrove to No. 92 M.U., to command; G. Tate to R.A.F. Neatishead; K. H. Wallis to H.Q., Fighter Command, for technical staff duties; E. J. Wicht to R.A.F. Stradishall, to command the Administrative Wing; T. S. Wilkinson to No. 217 M.U., to command; B. L. Davis to Allied Forces Southern Europe, for staff duties; R. M. W. Henderson to H.Q., F.E.A.F., for administrative staff duties; J. C. Hutton to R.A.F. Middleton St. George, to command the Flying Wing; H. Mansell to Air Ministry, for duty in the Department of the C.A.S.; L. R. Mumby to H.Q., No. 40 Group, for air staff duties; L. B. Noyes to H.Q., Fighter Command, as officer commanding the examining team; B. E. K. Pemberton-Pigott to the R.A.F. College, Cranwell, as chief instructor, Equipment and Secretarial Wing; C. N. S. Pringle to R.A.F. Gaydon, for technical duties; E. N. Rooms to No. 49 M.U., to command; P. N. Sowman to No. 35 M.U., for administrative duties.

S/L.s G. Blakeman to H.Q., Bomber Command, for organization staff duties (with acting rank of wing commander); A. H. Chamberlain to Air Ministry, for duty in the Department of the C.A.S. (with acting rank of wing commander); B. G. Lock to Air Ministry, for duty in the Department of the Air Member for Personnel (with acting rank of wing commander); J. F. Pinnington as Air Attaché, Helsinki (with acting rank of wing commander).

Commissioned by his brother, G/C. W. Pickard, this posthumous portrait of G/C. P. C. Pickard—pilot of the Wellington "F for Freddie" in the film "Target for Tonight"—has been painted by Mr. Alex Portner, who is seen here with his work.

IN BRIEF

The Queen has approved badges and mottoes for four more R.A.F. units in the United Kingdom—R.A.F. Pucklechurch, Bristol; the School of Fighter Control at Hope Cove, Kingsbridge, Devon; No. 271 Signals Unit and No. 4 Ground Radio Servicing Squadron.

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No. 24 M.U. at Stoke Heath, Salop, is to be moved to Sealand, near Chester, at about the end of this year or early in 1959.

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A Spitfire flown by No. 66 Sqn. during the Battle of Britain, and kept at R.A.F. Manston in recent years as a memorial, is to be returned to the squadron at R.A.F. Acklington in Northumberland. It will probably be on view there when the station is opened to the public on Battle of Britain Saturday (September 20).

* * * * *

Fireflash and Firestreak missiles, a full-scale replica of Bloodhound and a scale model of Thunderbird will be among exhibits on the R.A.F. stand at this year's National Radio and Television Exhibition (Earls Court, London, from August 27 to September 6). The Auster which was operated by the R.A.F. detachment with the Transantarctic Expedition will also be on show.

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Following the discovery of a crack in an internal member of the tailplane of one of the aircraft, Handley Page Victors of No. 10 Sqn. at R.A.F. Cottesmore, Rutland, have been temporarily grounded for inspection. It is hoped to complete this, and any necessary rectification, by early next month.

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S/L. V. S. Erskine-Lindop, who has been secretary of the R.A.F. Benevolent Fund since 1939 (having joined it in 1935 as assistant secretary), has retired and been succeeded as secretary of the relief branch of the Fund by G/C. C. E. J. Baines. The new secretary, who retired from the R.A.F. last March, was president of the selection board at the R.A.F. College, Cranwell, for some 3½ years until his retirement.

* * * * *

No. 1 Squadron, Royal Rhodesian Air Force, has been moved to Aden. Equipped with Vampires and now commanded by S/L. C. H. Paxton, it is under the operational control of the C-in-C. British Forces Arabian Peninsula, A.V-M. M. L. Heath. The squadron, which is supported by No. 3 Sqn., R.R.A.F. (equipped with Dakotas and Pembrokes), was on attachment at Aden for six weeks early this year.

Bringing aboard the captain, Cdr. W. R. Anderson, a Naval Whirlwind lands on the nuclear-powered U.S.N. submarine "Nautilus" as she nears Portland on August 12 after her historic voyage beneath the North Pole. Her number was painted-out for this operation.

CORRESPONDENCE

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns. The names and addresses of the writers, not for publication in detail, must in all cases accompany letters.

That R.34 Memorial

I SHOULD like to congratulate J. M. Bruce (Correspondence, August 8) on his stand against the threatened installation of the crude device selected by the Air League for the R.34 memorial. Of course he is right; the thing is meaningless, especially as a memorial.

The principal function of a memorial in this case is to record the achievement of the gallant crew of the R.34, and as such only a work of art can command interest, respect and admiration today and hereafter.

There is no art in the ridiculous gimmick put forward; it bears an unfortunate resemblance to a distorted fragment of the wrecked airframe, for which it will no doubt be accepted in the course of time.

Such abstractions are often the work of frustrated artisans who find it easier to shock than to create a thing of beauty, believing that any publicity is good publicity. They are reasonably certain of a mention, if only by critics who to be heard at all will write favourably about such things.

Alfriston, Sussex. FRANK WOOTTON, S.Av.A., S.M.A.

THE letter from Mr. J. M. Bruce on the R.34 memorial pretends to be "deadly serious." To the reader its noisy diatribes against this sincere and imaginative achievement seem to lie somewhere on the border between an essay in entertaining verbosity and the behaviour of that reactionary creature the ostrich.

Not long before the time when the R.34 was achieving its splendid feats there were many people, of the same unadventurous stuff, willing to be scandalized by the fact that mankind was flying at all. "God made birds to fly and men to walk on the ground" or "the Wright brothers should be condemned for flying in the face of Nature," they might have said. Fortunately nobody of consequence took notice of such dare-nothings, and it is to be hoped that the Air League will equally take no notice of this more recent howl of protest.

Mr. Bruce describes the sculpture as "a scrawny, lumpy and lopsided thing." This itself lopsided insult will be accepted by readers of his letter in the same mood as a description of the airship itself in such irrelevant terms as "bulbous," "bloated," etc.

I for one vigorously applaud the Air League's bold and enlightened action and will look forward to viewing this strange but fascinating memorial on my way out to countries where creative achievement is perhaps received with more encouragement.

Welwyn, Herts. W. G. COLDREY.

I SHOULD like to join with Mr. Bruce and others in expressing dismay and horror at seeing the illustrations of the proposed memorial to R.34. The facts (1) that the artist is a distinguished modern sculptor, and (2) that the work is—or may be—one which will do credit to British art, are quite beside the point.

First of all, and unbelievably, it was not made clear to the artist (or did the artist fail to understand or to care?) that there are two fundamentally different types of flying, aviation and aerostation, and that whatever else the artist felt like symbolising, he should on no account show a symbol of aviation when the event he is celebrating was a lighter-than-air flight. So he has—of all ridiculous things—symbolised an airship flight by a grotesque and ponderous bird (or bat) form; this must be one of the most egregious blunders in memorial art. It is no use saying that the content of any work of art is irrelevant in such cases, or that the symbolism is of flight in general. If there is a symbol, it must be a symbol of something, and that something must be the right thing. It is mandatory that the content of a work of art, however symbolic, must be relevant; and to symbolise lighter-than-air flight by a heavier-than-air symbol is inexcusable on any grounds conceivable, artistic, logical, emotional or what you will.

Secondly, why entrust the work to that particular artist, knowing full well what he had produced in the past? Everyone in the art world knows that there are some excellent sculptural styles running parallel today, none of which is better or worse as a style than the other. The chosen artist represents one very narrow abstract sculptural school of thought, and by no means approved of by all the pundits. If the event to be commemorated had happened today, there *might* have been some case for choosing such a man: but as it occurred in 1919, there can be no case for such a choice.

Memorial art owes its prime duty to that which is being commemorated, and should never be carried out for the purpose of enhancing anyone's, or any nation's, artistic prestige. It is astonishing that the Committee did not see the artistic possibilities inherent in the beautiful shape—abstract art in itself—of the R.34, and insist on its inclusion.

One cannot help feeling that, in all aspects of this unhappy business, the Committee has simply not cared a scrap for anything but a partisan prestige approach to the subject, pursued in the most doctrinaire blinkers, and knowing perfectly well—and, I repeat, not caring—that the symbolism was inadmissible, that the artistic style was inappropriate, and that most of the air world and the public, together with a large part of the art world, would strongly dislike the fearsome *grotesquerie* now chosen to commemorate the achievement of a famous lighter-than-air aircraft, its designers and its proud crew.

London, W.1. CHARLES H. GIBBS-SMITH.

Agricultural Helicopters

WHILE Mr. Foster's article, in the issue of August 1, displays an admirably strong tendency in the right direction, his figures are somewhat optimistic.

Starting with his payload of 1,200 lb and making it as high as 30 per cent of the all-up weight yields a gross weight W of 4,000 lb. For the sake of safety and direct control manageability the disc load should be kept, say, to a value of 2 lb/sq ft, which for a two-bladed rotor would entail a diameter of 50ft.

On the assumption of a ratio of W/P being of the order of 4 for pressure-jet helicopters, where P is the summation of rotor horse-power and engine horse-power, a value of $P=1{,}000$ would be necessary. Further taking a fairly optimum ratio of r.h.p./e.h.p.=0.7 and assuming the good figure of unity s.f.c. for the engine plus burning jets (burning in order to achieve r.h.p./e.h.p. =0.7) would require 1,000 lb of fuel for one hour's endurance.

With an engine weight of 400 lb, assuming a power : weight ratio of 1.5, pilot 180 lb, fuel 1,000 lb, and payload 1,200 lb, a residue of 1,220 lb would be left for the airframe, head and blades. The empty weight would thus be considerably less than 50 per cent of the gross weight.

In order, therefore, to meet some of Mr. Foster's requirements, a helicopter which has an all-up weight of the order of 5,000 lb would be necessary. This precludes a small simple helicopter, an even highly developed Palouste, and an endurance of two hours.

Taplow, Bucks. H. ADLERSTEIN, A.R.T.C.

Pioneer Aerobatics

PEGOUD is generally considered the man who first looped the loop. That indeed was my view until I recently read William A. Robson's *Aircraft in War and Peace*, first published in 1916.

On page 36 he gives the credit to an M. Chanteloup who, he states, was deliberately looping (much to the annoyance of his superior officers) some 14 days before Pégoud's first attempt.

These facts, though uncorroborated to the best of my knowledge, appear to have substance, and I would be interested to know if any other reader feels that the laurels should be Chanteloup's.

Should this be the case, Pégoud's name will still have a place in aviation history. According to all reports, he was a very accomplished pilot and Dallas Brett reports him as being the first deliberately and successfully to bunt (on September 1, 1913). This surely, though probably not realized at the time, was a much greater step in the realm of aerobatics and personal hazard than the loop.

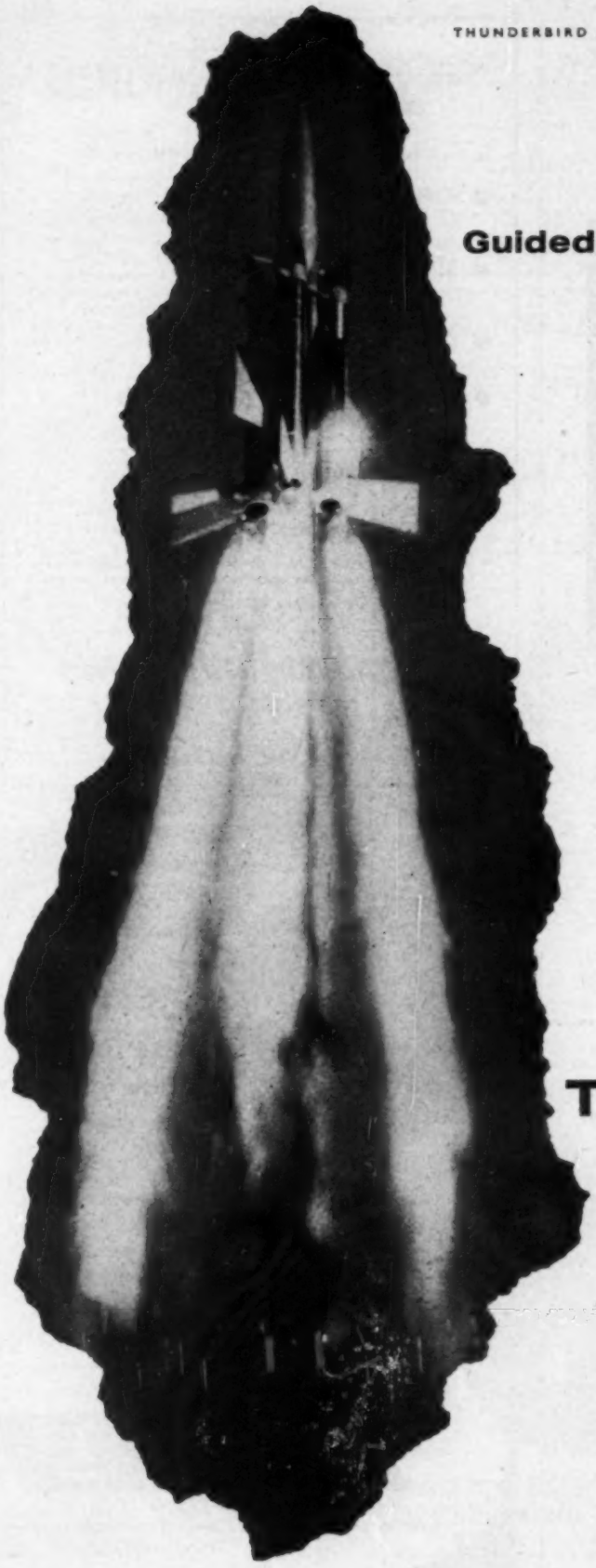
Windsor, Berks. C. JOHN BARRON.

CORRESPONDENCE IN BRIEF

Mr. H. R. Bantock, writing from 81 Queen's Road, Buckhurst Hill, Essex, is seeking photographs of, or information on, the dirigible which Col. Umberto Nobile was engaged in building and testing for the Italian Government in the period 1926-27.

FORTHCOMING EVENTS

Aug.	24.	Luton Flying Club: Display.
Aug.	31.	Oxford Aeroplane Club: At Home, Oxford Airport.
Sept.	1.	S.L.A.E.: "The Engineering Development of Turbine Aircraft," by D. J. Lambert. (At Farnborough.)
Sept.	1-7.	S.B.A.C. Display and Exhibition, Farnborough.
Sept.	4-6.	AGARD Avionics Panel Meeting, Cambridge.
Sept.	8-13.	International Congress of Aeronautical Sciences, Madrid.
Sept.	21.	B.G.A.: National Sailplane Aerobatic Contest, Dunstable.
Sept.	21.	Royal Belgian Aero Club: 900 cu m Balloon Competition.
Sept.	21.	Milan Aero Club: Rally.
Sept.	23.	R.Ae.S., Luton Branch: Film Evening.
Sept.	25.	R.Ae.S., Graduates' and Students' Section: "The Next Generation of Civil Aircraft," by G. H. Lee.
Sept.	26-29.	Austrian Aero Club: Innsbruck Rally.
Oct.	9.	Society of Instrument Technology: "Aircraft Flight Simulators," by Dr. A. E. Cutler.
Oct.	16.	R.Ae.S., Graduates' and Students' Section: "The Fatigue of Aircraft," by Major P. L. Teed.
Oct.	20-29.	AGARD meetings, Copenhagen.



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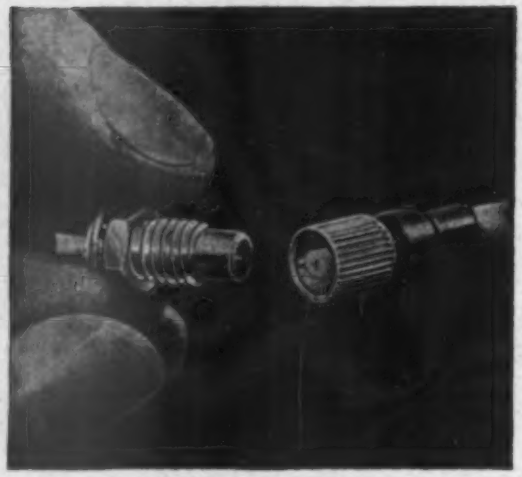

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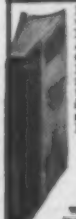

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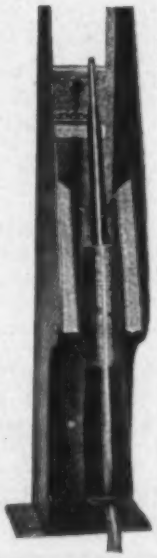

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AIR TRANSPORT ADVISORY COUNCIL

THE AIR TRANSPORT ADVISORY COUNCIL give notice that they have received the undermentioned applications to operate scheduled air services:—

FROM Starways, Ltd., of Liverpool Airport, Liverpool, 19:—
Application No. 2203 for a Normal Scheduled Service with D.C.3 or D.C.4 aircraft for the carriage of passengers and supplementary freight on the route Liverpool - London Airport - Paris, at a frequency of from two to four return flights weekly for 5 years from October 1958

FROM B.K.S. Air Transport, Ltd., of Berk House, Baker Street, London, W.1:—
Application No. 2205 for a Normal Scheduled Service with Dakota and Ambassador aircraft for the carriage of passengers, supplementary freight and mail between Leeds and Dublin, at a frequency in accordance with traffic demand, for 7 years from 1st April 1959.

THESE applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on 30th July, 1952. Any representations or objections with regard to these applications must be made in writing, stating the reasons, and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3 Dean's Yard, London, S.W.1, from whom further details of the application may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. [8194

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MINISTRY OF SUPPLY RESEARCH AND DEVELOPMENT ESTABLISHMENTS, mainly in southern half of England, require (a) Senior Scientific Officers (min. age 26) and (b) Scientific Officers for work in Physics, electronics, electrical or mechanical engineering, applied mathematics, aerodynamics, chemistry or metallurgy. 1st or 2nd class hons. Degree or equiv. required and for S.S.O. at least 3 years' post graduate experience. Starting salary in range (a) £1,130—£1,330, (b) £595—£1,050 (male, in provinces). Rates for women reaching equality in 1961. Superannuation under F.S.S.U. Opportunity for those under 32 to compete for established posts. Candidates should indicate fields of work in which interested. At National Gas Turbine Establishment, Pyestock, Hants., houses available for letting to married staff, and opportunities for new graduates to have workshop training. Forms from M.L.N.S. Technical and Scientific Register (K), 26 King Street, London, S.W.1 (quote A.300/8A). [8190

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INDEX TO ADVERTISERS

	Page
Abbey Panel and Sheet Metal Co., Ltd.	Cover iii
Adcola Products, Ltd.	38
Aircraft and General Finance Corpn., Ltd.	34
Amalgamated Wireless (Australasia), Ltd.	7
Anaphenol (Great Britain), Ltd.	36
Anticoustic, Co., The	40
Armstrong Siddeley Motors, Ltd.	Facing Edit. Page 258
Attewell and Sons, Ltd., B.	38
Avro Aircraft, Ltd.	Facing Edit. Page 259
Bell Precision Engineering Co., Ltd.	36
Blackburn and General Aircraft, Ltd.	4, 5, 33
Boulton Paul Aircraft, Ltd.	3
Bristol Aeroplane Co. of Canada, Ltd., The	9
Bristol Siddeley Engines, Ltd.	Cover iv
British Air Line Pilots Association, Ltd., The	38
British Institute of Engineering Technology	38
Canadair, Ltd.	Between Edit. Pages 258/9
Canadian Applied Research, Ltd.	Cover ii
Cellon, Ltd.	12
Central Office of Information (R.A.F.)	Between Edit. Pages 266/7
Cornercroft, Ltd.	34
Cory Brothers and Co., Ltd.	6
Cross Manufacturing Co. (1938), Ltd.	37, 38
De Havilland Aircraft of Canada, Ltd.	23
De Havilland Engine Co., Ltd., The,	Cover i
Delaney Gallay, Ltd.	31
Dowty Equipment of Canada, Ltd.	Between Edit. Pages 270/1
Elliott Bros. (London), Ltd.	2
English Electric Co., Ltd., The	35
Fairey Aviation Co., of Canada, Ltd., The	30
Fairey Aviation Co., Ltd., The	Facing Edit. Page 262
Ferranti, Ltd.	32, Between Edit. Pages 270/1
Harringay Photo Supplies	38
Hawker Aircraft, Ltd.	Facing Edit. Page 271
Henshall and Sons (Addlestone), Ltd., W.	8
Hunting Aircraft, Ltd.	Facing Edit. Page 263
Irish Air Charter, Ltd.	38
Lewis, Ltd., D.	39
London School of Air Navigation	39
Lucas/Rotax	Between Edit. Pages 258/9
Luton Airways, Ltd.	38
Martin-Baker Aircraft Co., Ltd.	Facing Edit. Page 267
Orenda Engines, Ltd.	Facing Edit. Page 270
Palmer Aero Products, Ltd.	1
Rolls-Royce, Ltd.	10
Rotol, Ltd.	29
Royal Dutch Shell Group	39
Royal Rhodesian Air Force	39
Shackleton, Ltd., W. S.	37
Shell Aviation Service	Facing Edit. Page 266
Simmonds Aerocessories of Canada, Ltd.	36
Teddington Aircraft Controls, Ltd.	8
Trans-Canada Air Lines	24
Vickers-Armstrongs (Aircraft), Ltd.	11

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